Phase-Driven Phonological Domains in Gayogo̲hó:nǫ̀ʔ

by

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Abstract

This thesis presents a novel analysis of the long-standing debate on phonological domains within the Gayogo̲hó:nǫ̀ʔ verbal complex. Building from the Minimalist and Distributed Morphology frameworks and the Phonology by Phase approach, the analysis proposes that the phonological domains arise from a three portion phase-based syntax: a categorising *v*P phase, a VoiceP phase, and a CP phase, all linked to different phonological computations. In addition to providing a solution to a cross-Northern Iroquoian problem, this thesis contributes to the future study of that family by arguing for the first time for a categorising *v*P within the verbal complex. It is hoped that this work will prove useful for further research into word-internal phonological and semantic domains in Northern Iroquoian.

Gaegwe:gǫh tsiyohwǫja:gwe:gǫh gaehwagǫnyǫsta? ne:hni? gaehwa?nigǫhah, gakehyadǫhsagye?s. Ne:? hǫ:ni? gaǫknigǫhi:yo:hsdǫh i:so? degadǫnǫhǫ:nyǫh.

Do gach gaiscíoch teanga agus do gach cumhdaitheoir teanga atá an tráchtas seo tiomnaithe.

This study is dedicated to everyone working to keep their language alive.

Lay summary

This thesis provides a new analysis of the distribution of some sound patterns in Gayogo̲hónǫʔ through a model of its verbal structure. In particular, this thesis argues that the extents of patterns of sound addition - epenthesis - in the verb are defined by naturally occurring boundaries within its structure. The evidence for this argument comes from language-internal sound patterning, the formation of idioms, and cross-linguistic norms. The major contributions of this work are theoretically oriented, namely: that there is an unpronounced element within the verb which gives it its part of speech, and that sound patterns in Gayogo̲hónǫʔ are predictable by their structural position. However, the final structure proposed, and the evidence that builds to it, highlights areas where there is need of additional description and documentation in the language, particularly in how sound patterns manifest in other areas of the grammar. Last, this thesis provides grounds for comparative research into similar sound patterns in other languages of the Northern Iroquoian family, and furthers the understanding of the word in polysynthetic languages more broadly.

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List of abbreviations

1 First Person
2 Second Person
3 Third Person
AG Agent Series
APPL Applicative
ASP Aspect
AUG Augmentative
CIS Cislocative
CUST Customary
DIM Diminutive
DU Dual
EPEN Epenthesis
F Feminine or Mixed Gender
FACT Factive Mood
FUT Future Mood
JOIN The Joiner Vowel
LINK Germanic-Style Linker
M Masculine Gender
N Neuter Gender
NEG Negative
NFS Noun Forming Suffix
NOUN Dummy Noun Root
OPT Optative Mood
PAT Patient Series
PL Plural
PUNC Punctual Aspect
PURP Purposive
SG Singular
SRF Semi-Reflexive
STAT Stative Aspect
TRANS Translocative

Chapter 1

Introduction

This thesis treats the long-standing problem of multiple phonological domains within the verbal complex of Gayogo̲hó:nǫʔ, a Northern Iroquoian language, as arising from its morphosyntax. The solution proposed makes use of Phase Theory (Chomsky 2001) and Distributed Morphology (Halle & Marantz 1993) to derive the verbal complex through three different morphosyntactic structures with three different phonological computations. The analysis makes the novel claim that the Gayogo̲hó:nǫʔ verbal complex is split by two internal phases based on phonological and semantic evidence as well as cross-linguistic norms.

Briefly, the problem - first identified by Michelson (1988) - is that there are three domains of epenthesis within the Gayogo̲hó:nǫʔ verbal complex. Two of these domains have the same phonological conditioning but different morphological conditioning and epenthesise different vowels. These domains are exemplified in the following data set in (1). Note that the use of EPEN and JOIN in the morpheme-by-morpheme gloss is for clarity only and is not meant to imply that these vowels are underlying; this is standard Iroquoianist practice (see Michelson 1988 for instance).

(1) a. *Odedrę́náíʔ*
o-at-e-trę-a-iʔ
3.SG.Z.PAT-SRF-EPEN-$\sqrt{odour}$-$\sqrt{be.stuck.to.something}$-PUNC

"An odour." [Dyck 2009: 581]

b. *Swagwiyaędadrę́ʔ*
s-wak-wiy-a-yęt-a-tr-ęʔ
REP-1.SG.PAT-$\sqrt{child}$-JOIN-$\sqrt{have}$.CAUS-JOIN-PURP-PUNC

"I'm going to have another child." [Dyck et al. 2021]

The minimal pair in (1) shows that the underlying consonant /ttr/ cluster is resolved with two different vowels in different morphological positions. In (1a), the /ttr/ cluster between the semi-reflexive head and the incorporated noun root is resolved through epenthesis of an /e/ vowel, while an /a/ vowel is epenthesised between the incorporated noun root and the verb root in (1b) (this operation is also known as Joiner epenthesis). Additionally, there is another epenthesis domain which is definable by both morphology and phonology; the noun root and verb root bundle. The minimal pair in (2), below, shows that the domain of /a/-epenthesis between the incorporated noun and verb is different from the domain of /a/-epenthesis in the rest of the verb stem.

(2) a. *Enakdowé:ktaʔ*
e-nakt-owe:k-t-haʔ
3.SG.INDEF.AG-$\sqrt{bed}$-$\sqrt{cover}$-CAUS-HAB

"A bedspread." [Froman et al. 2002: 26]

b. *Odrehdagayǫhgéha:ʔ*
o-treht-a-kayǫh-keha:ʔ
3.SG.N.PAT-$\sqrt{car}$-JOIN-$\sqrt{old.thing}$-CUST

"An antique car." (Lit. It is like an old car) [Froman et al. 2002: 47]

In the pair in (2) both verbal complexes have an underlying stop-stop cluster at a morpheme boundary, however, only the cluster in (2b), which occurs between the incorporated noun /-treht-/ and the verb root /-kayǫh-/, is resolved. The parallel cluster in (2a) is /kth/, which surfaces as [k^ht^h]. It occurs between the verb root, causitive suffix, and habitual suffix, but is not resolved. The noun+verb bundle then has a different phonological conditioning from the rest of the verb stem and occurs at a different morphological boundary; meaning it is another domain. There are then three epenthesis domains in the verbal complex: /e/-Epenthesis between the prefixes and the closest right-adjacent root, /a/-Joiner epenthesis between the incorporated noun root and the verb root, and /a/-Joiner epenthesis between the verb root and a right-adjacent suffix, or between suffixes.

This data was first treated through a solely phonological lens by Michelson (1988). Her analysis required stipulation within phonological rules of the exact morpheme boundaries that each epenthesis operation targeted. Soon after, a model was proposed by Dyck (1990) which acknowledged the morphological regularity of this system. Most recently, the data was addressed through a phase-based model (Barrie 2018), which proposed that the /e/-epenthesis and joiner vowel domains were two different portions of phonological computation corresponding to the CP and vP phases, respectively. However, the appearance of a vowel between the noun and verb roots was argued not to be epenthetic but rather to be the head of a TopP phrase to which the noun raises in incorporation structures. Barrie (2018) then does not argue for a distinct phase in which epenthesis between the incorporated noun and verb occurs, but rather that this joiner vowel is a morpheme itself.

The solution argued for in this thesis takes Barrie's (2018) phasal analysis several steps further. First, in Section (3.3), it is argued that the incorporation structure

presented in Barrie (2018) cannot account for the breadth of incorporation data in Gayogo̲hó:nǫʔ, and is theoretically impossible besides, and therefore that epenthesis between the incorporated noun and verb cannot be the head of a phrase. Instead of the TopP-as-joiner-vowel analysis, in Section (5.1) it is argued based on phonological and idiom formation data that the incorporated noun and the verb root are part of a categorising little *v*P phase separate from the external-argument-introducing VoiceP phase (Kratzer 1996). This phase is assumed to have separate phonology from the other phases along the lines of a Stratal Optimality Theory approach (Bermúdez-Otero 2017) or a Cophonologies by Phase approach (Sande & Jenks 2018, Sande, Jenks & Inkelas 2020). Next, in Section (5.3), it is argued that the VoiceP phase corresponds to the Joiner epenthesis domain, and that the CP phase corresponds to the /e/-epenthesis domain.

The approach taken here is situated within the emerging Phonology by Phase approach first taken by Marvin (2002). This approach proposes that phases correspond to different portions of phonological computation, though researchers differ in whether they assume that phonological rules or constraints vary or stay constant between different phases. This thesis proposes that, at least for Gayogo̲hó:nǫʔ, rules or constraints must be allowed to differ between phases. The Phonology by Phase approach provides new tools for phonosyntactic research into polysynthetic languages like Gayogo̲hó:nǫʔ. The approach was first applied to polysynthetic languages of Turtle Island by Barragan and Newell (2003) on Kupangaxwicham Pe'me̲melki (Cupeño: Uto-Aztecan), and then subsequently by Newell (2008, 2015) and Newell and Piggott (2014) on Anishinaabemowin (Ojibwe: Algonquin) and by Weber (2020) on Siksiká (Blackfoot: Algonquin). This thesis extends that body of work into a new language family and presents avenues for future research with regards to long-distance dependencies across phase boundaries. In doing so, it also provides additional evidence and

argumentation for the fractured nature of the polysynthetic word (Bickel & Zúñiga 2017, Zúñiga 2019).

In addition to its implications for the Phonology by Phase approach and theories of polysynthesis, this thesis presents a number of novel innovations for the study of Northern Iroquoian languages. Most importantly, this study is the first to propose the VoiceP-*v*P split in that family. The assumption of the split verbal complex points to avenues of research that have not been followed in Generative studies of Northern Iroquoian previously, for example: the mechanics of long-distance dependencies, and the formation of idioms. As well, this study represents the first large scale research into the implications of Phase Theory on Northern Iroquoian linguistics. Last, given that all Northern Iroquoian languages have comparable epenthesis domains (see Michelson 1988), this work provides a jumping off point for future comparative studies between Gayogo̲hó:nǫʔ and other Northern Iroquoian languages, as well as between Tsalagi (Cherokee: Southern Iroquoian) and its distant cousins, or between Northern Iroquoian and languages with comparable verb structures, such as those in the Caddoan family (see Chafe 1976 for points of Siouan-Caddoan-Iroquoian comparison).

This study is structured as follows. First, the language will be presented with a focus on phonological domains within the verb in Chapter 2. Next, previous analyses will be summarised and argumentation will be given against Barrie's (2018) solution in Chapter 3. Then, in Chapter 4, the theoretical apparatus assumed here will be spelled out. Afterwards, the analysis proper will be given in Chapter 5. Finally, in Chapter 6, implications will be discussed and this work will be concluded.

Chapter 2

Phonological Domains in Gayogo̲hó:nǫ̀'

This chapter will provide an overview of the phonology and morphosyntax of Gayogo̲hó:nǫ̀ˀ, and an in-depth description of phonological domains within the language. Gayogo̲hó:nǫ̀ˀ is a member of the Lake/Five Nations branch of the Northern branch of the Iroquoian family (Mithun 1979, Schillaci et al. 2017) or, following Julian (2010), it is a member of the unarticulated Northern branch of Iroquoian. It is spoken natively by some 55 people in present-day Ontario (Statistics Canada 2016), largely in Ohsweken, and also in present-day New York. There are substantial revitalisation efforts underway in Ohsweken in the form of immersion programming, second-language teaching, and a Bachelor's degree in the language at Six Nations Polytechnical Institute. There are also revitalisation efforts underway in communities in New York and Oklahoma.

The study of Gayogo̲hó:nǫ̀ˀ dates to at least the early 1830's, with Gallantin (1836) representing a very early work. While Chafe (1976) notes the under-representation

of Gayogo̱hó:nǫʔ in the literature as a whole, modern descriptive and documentary scholarship has progressed significantly since and there is now a grammatical sketch (Dyck et al. 2014), a teaching text (Mithun & Henry 1984), a handbook of verbal morphology (Sasse & Keye 1998), a full length dictionary (Froman et al. 2002), and a full length grammar (Dyck et al. 2021).

This chapter will be organised as follows. First, in Section 2.1, the language's phonological inventory and orthography will be described. In Section 2.2, there will be a description of the general morphosyntax of Gayogo̱hó:nǫʔ. Last, in Section 2.3, there will be a close look at phonological domains within the verbal complex.

2.1 The Phonological Inventory and Orthography

This section will provide a general overview of Gayogo̱hó:nǫʔ's phonemic inventory, syllable structure, and the - modified - Henry orthography which will be used throughout this thesis. This is not intended as an exhaustive description of Gayogo̱hó:nǫʔ phonology nor is it meant to provide the core data which this thesis attempts to analyse, which will be presented in Section 2.3.

As is typical of the Northern Iroquoian languages (Lounsbury 1978), and the North Eastern Woodlands area more generally (Sherzer 1976), Gayogo̱hó:nǫʔ has a relatively small phonemic consonant inventory. Below in Table 2.1 is included the consonant inventory (adapted from Dyck et al. 2014: 6).

	Alveolar	Palatal	Velar	Glottal
Stop	t t^h		k k^h	ʔ
Nasal	n			
Fricative	s s^h			h
Affricate	ʦ $ʦ^h$			
Approximate	ɹ	j	w	

Table 2.1: Consonant Inventory

The Gayogo̲hó:nǫʔ vowel inventory is of four oral vowels and two additional nasal vowels; which are ubiquitous in Northern Iroquoian. All vowel qualities have a phonemically long twin, equalling twelve phonemic vowels in total (Rudes 1995). Note that both high back vowels /u/ and /uː/ are rather rare, appearing in but one morpheme. They have been placed in brackets to reflect this marginal status. The vowel inventory is exemplified in Table 2.2 (adapted from Dyck et al. 2014: 6).

	Front	Central	Back
High	i iː		(u) (uː)
Mid	e eː ɛ̃ ɛ̃ː		o oː õ õː
Low		a aː	

Table 2.2: Vowel Inventory

The syllable in Gayogo̲hó:nǫʔ is maximally CV(V/L)C where V/L is either a vowel or a laryngeal (Dyck et al. 2014: 80). Note that laryngeals are part of the nucleus (Dyck 1999 and referernces therein). Any cluster at a syllable boundary will be parsed into a coda and onset, hence there can be no clusters in the onset or coda (see Dyck 2009 on extrasyllabicity). The evidence for this comes from the behaviour of stress assignment data (see Michelson 1988, Dyck 1997, 1999 for discussion of stress and syllable structure). Briefly, the default stress position is on the penultimate, however this pattern is disrupted if the penultimate is a closed odd-numbered syllable counting from the left-edge (Michelson 1988). In illustration, consider the examples in (3), below, where the stressed syllable is bolded.

(3) a. *ęh.ę.na.**dó:**.wat*
ę-hęn-a-tó:wat-ø
FUT-3.DU.M.AG-JOIN-$\sqrt{hunt}$-PUNC

"They'll hunt." [Michelson 1988: 98]

b. *ah.ih.**ó:**.wiʔ*
a-hi-hrowi-ʔ
FACT-1.SG:3.SG.M-$\sqrt{tell}$-PUNC

"I told him." [Michelson 1988: 99]

c. *hehs.**nǫ́:d**.rę́ʔ*
hehs-nǫtrę-ʔ
2.SG:3.SG.M-$\sqrt{follow}$-PUNC

"You follow him." [Dyck et al. 2014: 124]

d. *ęh.**éhs**.nǫd.rę́ʔ*
ę-hehs-nǫdrę-ʔ
FUT-2.SG:3.SG.M-$\sqrt{follow}$-PUNC

"You will follow him." [Dyck et al. 2014: 124]

The paradigm in (3) first shows two open syllables in even and odd positions in (3a) and (3b), respectively, both receive stress. In (3c), the stressed syllable is in an even numbered position and is stressed. However, when the parallel syllable is in an odd numbered position, as in (3d), the stress moves to the antepenultimate. The movement of the stress to the antepenultimate is then due to the penultimate having a closed syllable, and so it is argued that stop-stop and stop-sonorant clusters are disyllabic in Gayogo̱hó:nǫʔ. This syllabification algorithm will be important to keep in mind when considering examples of epenthesis.

This thesis makes use of the Henry Orthography for writing Gayogo̱hó:nǫʔ words and the Linguistic Orthography for writing the morpheme-by-morpheme gloss. This choice was made as a compromise between respect for the speaking community -

where the Henry Orthography is the norm - and clarity for those unfamiliar with the Iroquoian languages. Table 2.3 is a comparison between both orthographies and their IPA equivalents. This chart is not exhaustive and in particular does not include graphemes which are the same in both systems or how clusters are written in the Henry Orthography. Of particular importance in the Henry Orthography is that underlying /th/, /kh/, and /tsh/ are written as ⟨t⟩, ⟨k⟩, and ⟨ts⟩, respectively. In these cases, the underlying /h/ has not been deleted, but is merely written using a single grapheme. As a final note on glossing practice in this thesis, do note that the use of JOIN and EPEN for epenthesised vowels on the morphemic gloss line does not imply that they are underlying, but is done for the sake of clarity.

Henry	Linguistic	IPA
d	t	t
t	th	t^h
g	k	k
k	kh	k^h
ʔ	' or ʔor ˀ	ʔ
j	ts	ts
ts	tsh	ts^h

Table 2.3: Comparing Gayogo̱hó:nǫʔ Orthographies

This section has described the consonant and vowel inventories, and the orthography. Later sections will elaborate on those phonological phenomena which form the core data points of this thesis, in particular: epenthesis, extrasyllabicity, and the accent system. The following section will provide a deeper overview of the morphosyntax as a preliminary to the relevant data.

2.2 The Morphosyntax

This section will describe the general shape of Gayogo̲hó:nǫʔ morphosyntax. Particular emphasis will be given to the order of and interaction between morphemes within the verb and to the nature of noun incorporation. Like the preceding section on phonology, this section is not meant to be an exhaustive discussion but rather a basis from which to approach the rest of the work.

Cayuga is a prototypically polysynthetic language in that it has polypersonal agreement on the verb, productive noun incorporation, affixes lexically heavy material, is non-configurational, and is generally holophrastic (see Bickel & Zúñiga 2017 and Zúñiga 2019 for more information on definitions of polysynthesis). Like many polysynthetic languages, Gayogo̲hó:nǫʔ has more verb roots than noun roots and verbs are more numerous in discourse than nouns; though particles are more common still (see Mithun 2017 for data from Kanien'kéha, a related language). This section will begin by presenting the morphology of the word categories, before moving on to discuss long-distance dependencies in the verb, noun incorporation, and finally, utterance-level syntax.

The verb is highly complex, being made minimally from three morphemes, as shown in Table 2.4 below. In the example that follows, there is a verb root /hre/ which takes a pronominal prefix - here /k-/ - and the aspectual suffix /-haʔ/. All verbs require these three elements, unless they are in the imperative mood where they do not take an overt aspectual suffix (Chafe 1960).

Pronominal Prefix	Verb Root	Aspectual Suffix

Table 2.4: Minimal Verb Template

(4) *Kré:ha*ʔ
k-hre-haʔ
1.SG.AG-$\sqrt{put}$-HAB

"I'm setting it on something." [Froman et al. 2002: 250]

There is no meaningful maximum size of the verb due to the productive incorporation of complex elements. A near fully articulated verb template is included in Table 2.5 below. The highest level is here called the verbal complex, this term will be used when referring to the whole of the verb. Below that are the groupings of the prefixes and the verb stem; the phonological definition of these groups will be discussed in Section 2.3 and their morphosyntax will be a major point of analysis in Chapter 4. Below that level, the verb stem is broken into the noun-verb bundle, and the suffixes. These are split phonologically as will be discussed in 2.3 and differentiated syntactically in two ways: first some noun-verb bundles - to the exclusion of the suffixes - are idiomatic (identified by Foster, Michelson & Woodbury 1989 as bases), and second because the noun-verb bundle is lexical while the suffixes are grammatical. The next level down differentiates all the morphemes within the verb stem; incorporated noun, verb root, derivational suffix, aspectual suffix, and post-aspectual (also called expanded aspect) suffix. The prefix slots are not fully articulated in this template, instead there is an umbrella category of prepronominal prefixes, which includes a variety of slots defined by their position, and the pronominals, which are the pronominal prefixes, here not fully differentiated (see Lounsbury 1953), and the reflexives.

<table>
<tr><td colspan="7">Verbal Complex</td></tr>
<tr><td colspan="3" rowspan="2">Prefixes</td><td colspan="4">Verb Stem</td></tr>
<tr><td colspan="2">Noun-Verb Bundle</td><td colspan="3">Suffixes</td></tr>
<tr><td>Prepronominals</td><td colspan="2">Pronominals</td><td rowspan="2">Noun</td><td rowspan="2">Verb</td><td rowspan="2">Derivation</td><td rowspan="2">Asp</td><td rowspan="2">Post-Asp</td></tr>
<tr><td>Multiple Slots</td><td>Pronouns</td><td>Reflexives</td></tr>
</table>

Table 2.5: Verbal Template

A fully articulated example of the template is difficult to find, due in part to the specificity required to produce one. Despite this, many verbs are of considerable size and complexity. An example of a large verbal complex is included in (5) below. In this example there are two prepronominal prefixes - the future and the cislocative - two pronominal prefixes - the third person, feminine, plural agent and the semi-reflexive - an incorporated noun - food - a verb root - to make - and an aspectual suffix - the purposive. For more information about the verbal complex in Gayogo̲hó:nǫʔ see (Sasse & Keye 1998 and Froman et al. 2002) and in other Northern Iroquoian languages see: Martin (2018) on Kanien'kéha, Lounsbury (1953) and Michelson, Kennedy & Doxtator (2016) on Onyota'a:ká, Chafe (1996, 2015) on Onödowá'ga:', and Woodbury (2018) on Onǫda'gegá'.

(5) *Ętgaǫdekǫnyáhneʔ*
ę-t-kaǫ-at-e-khw-ǫny-a-hneʔ
FUT-CIS-3.F.PL.AG-SRF-EPEN-$\sqrt{food}$-$\sqrt{make}$-JOIN-PURP

"They will come and eat." [Dyck 1990: 18]

The noun in Gayogo̲hó:nǫʔ is much simpler than the verb. Nouns come in four different varieties: mono-morphemic, basic, deverbal, and kinship. The first is the smallest set. They consist of a single morpheme and are generally unincorporable. An example is included in (6). These will not be discussed further.

(6) *Gaʔga:ʔ*
kaʔka:ʔ
$\sqrt{crow}$

"A crow." [Froman et al. 2002: 76]

The basic nouns are those which take a pronominal prefix, a noun root, and a noun

forming suffix. These are more numerous than the mono-morphemic nouns though less numerous than deverbal nouns. The pronominal prefix they take when unpossessed is generally third person, singular, and neuter though it can differ in whether it is of the agent or patient series (see Mithun 1991 for an overview of pronominal series in Northern Iroquoian). Possessed basic nouns may take a full pronominal prefix paradigm and their series will depend on the alienability of the noun root. The phonological shape of the noun-forming suffix is lexically determined and does not provide any grammatical information. These can be incorporated, as will be discussed later, and can also take nominal suffixes such as the augmentative or locatives. An example is included in (7) below.

(7) *Ohshéʔaʔ*
o-hsheʔ-aʔ
3.N.SG.PAT-$\sqrt{dough}$-NFS

"Dough." [Froman et al. 2002: 94]

The deverbal nouns are the most rich and varied of the noun varieties. They are - sometimes frozen - verbal complexes which are used as nouns. They may be formed with a nominaliser though they often are not, in which case they are generally descriptive or idiomatic and can occur in either the habitual or stative aspect and with any amount or type of prepronominal prefixes. Generally speaking, deverbal nouns can be incorporated or suffixed with nominal suffixes only when they have an overt nominaliser (Barrie & Jung 2020 and references therein). Verbal nouns, as in (8b), cannot be incorporated. Two examples are given below in (8). In (8a), the verb root 'hyatǫ' has been nominalised and appears with basic noun morphology. In contrast, in (8b), the verb is descriptive of what someone does habitually and is fully verbal; this is typical of words for professions and tools (Dyck et al. 2014).

(8) Deverbal and Verbal Nouns

a. *Gaahyádǫhsraʔ*
ka-hyatǫ-hsr-aʔ
3.N.SG.AG-$\sqrt{write}$-NLZR-NFS

"Paper." [Froman et al. 2002: 224]

b. *Haheyǫdahsrǫ́:nih*
ha-heyǫt-a-hsrǫ́:ni-h
3.M.SG.AG-$\sqrt{body}$-JOIN-$\sqrt{fix}$-HAB

"An undertaker" (Lit. He fixes bodies) [Froman et al. 2002: 352]

Lastly, there are the kinship nouns. These are not formally nouns and yet are not quite the same as verbs (see Koenig & Michelson 2010 for in-depth discussion of kinship terms in Onyota'a:ká:, a related language). Kinship terms are generally formed from an interactive pronominal prefix and a root. They cannot take verbal suffixes or prepronominal prefixes. They can however take category-neutral suffixes such as the diminutive, as in (9).

(9) *Heʔgę́:-ʔęh*
he-ʔgę:-ʔęh
1.SG:3M.SG-$\sqrt{younger.sibling}$-DIM

"My younger brother." [Dyck et al. 2014: 11]

Apart from verbs and nouns, the only other part of speech is the particle. Note that adjectives are generally accepted to not exist as a word class separate of verbs in Northern Iroquoian languages (Chafe 1960). Particles are largely monosyllabic and near exclusively monomorphemic, but are semantically heterogeneous. They are definable as a class because they do not need to conform to the disyllabic minimum word length as nouns and verbs do (see Rueentan 2014 for discussion and analysis of

particle and particle group phonology in Gayogo̲hó:nǫʔ). They will not be discussed frequently in this work. Having surveyed the parts of speech, this section will now turn to morphosyntactic phenomena.

The Gayogo̲hó:nǫʔ verbal complex - much like all Northern Iroquoian languages - is notable for its extensive use of noun incorporation (see Lounsbury 1949; Mithun 1979; Michelson 2016 for a family-wide perspective). Noun incorporation is the placing of a noun within a verb - both syntactically and phonologically - creating a complex predicate. The phenomenon is cross-linguistically diverse in both how the noun becomes incorporated and the effects of the incorporation (see Massam 2017 for a recent overview). Gayogo̲hó:nǫʔ noun incorporation is canonical (in the sense of Mithun 1984) in that the noun is placed within the verb stem and restricts the reading of the verb and the complements it can occur with.

Noun incorporation in Gayogo̲hó:nǫʔ depends on a variety of factors. First, the verb can require incorporation, can allow it optionally, or can completely disallow it. Noun roots may also allow for incorporation optionally or disallow it entirely, however they cannot require incorporation. Only patients are incorporated, whether the subject of an unaccusative or the object of a transitive (see Woodbury 1975a; 1975b on Onǫda'gegá'). Apart from morphosyntactic concerns, noun incorporation is also governed by discourse; when possible, a noun will be incorporated when it is backgrounded or discourse-old, but will not be if it is discourse-new or foregrounded (Mithun 1992; 1995; Chafe 1994). Below is a pair of sentences with the same noun /ʔnhǫhs/ 'egg' unincorporated and incorporated (note that the orthography and glossing have been changed from the source).

(10) Noun Incorporation

a. *Oˀnhǫhsaˀ* *hniˀ* *to* *í:wa:t*
o-ˀnhǫhs-aˀ hniˀ tho í:wa:t
3.SG.N.PAT-$\sqrt{egg}$-NFS too there it.is.in.there

"There are some eggs in there too."

b. *Tę̨ˀ* *dę̲ˀgę́:* *hne:ˀ* *a:sę̲ˀnhǫhsaníhaˀ*
thę̨ˀ teˀ-kę́: hne:ˀ a:-s-e-ˀnhǫhs-a-niha-ˀ
NEG NEG-COP in.fact OPT-2.SG.AG-EPEN-$\sqrt{egg}$-JOIN-$\sqrt{borrow}$-PUNC
hniˀ
hniˀ
too

"Don't you think you should borrow eggs too?" [Mithun 1999: 429]

In (10), the same noun root appears in two different morphosyntactic contexts. First, in (10a), the noun is unincorporated and appears with a pronominal prefix and a noun-forming suffix. In the incorporated example in (10b), the noun has been stripped of its morphology and appears within the verbal complex preceding the verb root. This is not the only shape that incorporates take, however. Incorporates may also be a verb root with a nominaliser, as in (11) below.

(11) *Syadǫhsráę̨díˀ*
s-hyatǫ-hsr-a-yę̨tei-ˀ
2.SG.AG-$\sqrt{write}$-NLZR-JOIN-$\sqrt{know}$-HAB

"You are smart." [Froman et al. 2002: 300]

The other major morphosyntactic phenomena situated within the verb are the long-distance dependencies. There are at least three long-distance dependencies within the verb: prepronominal prefixes required by the verb root, pronominal series choice, and the mood-aspect system. The first two of these will be but briefly described here

as a full treatment of any one would cause this section to be unduly long. The latter will not be described here as the dependencies have not been thoroughly treated in the literature, though see Foster (1986) for a discussion of the history of tense-aspect-mood description in Northern Iroquoian.

Many verb roots in Gayogo̲hó:nǫʔ require certain prepronominal prefixes for particular - sometimes idiomatic - meanings or to function at all. This occurs sometimes regardless of whether the interpretation of the root has the canonical meaning of the prepronominal prefix contained within it. Some examples are verbs of motion requiring locative prefixes, verbs of doing requiring the partitive, and verbs with a notion of duality requiring the dualic. Example (12) below, contains a verb root that is ungrammatical without a locative prefix. Here it occurs with the translocative. Although the Gayogo̲hó:nǫʔ prepronominal prefixes have not been treated in the theoretical literature, there has been analysis of the parallel system in Onyota'a:ká (Diaz, Koenig & Michelson 2019).

(12) *Tagihnǫ:s*
t-hak-ihnǫ:k-s
CIS-3.SG.M:1.SG-$\sqrt{call}$-HAB

"He calls me." [Dyck et al. 2021]

The Northern Iroquoian languages have a complex system for expressing grammatical role-like information in the pronominal prefixes (for Gayogo̲hó:nǫʔ see Deer 2011; for Onǫda'gegá' see Abrams 2006, and for Kanien'kéha and active-stative systems generally see Mithun 1991). The pronominal prefixes come in three series: agent, patient, and interactive. The former occurs most often with canonically agent-like and volitional subjects in transitive clauses with a non-human object. The patient

series occurs with patient-like subjects or with human objects when the subject is non-human. The interactive prefixes occur solely when there are two human arguments of a verb. There is, however, an area of the grammar where this generalisation is not coherent; the single-aspect, neuter verbs (Dyck et al. 2021).

The single-aspect, neuter verbs are those verb roots which can only occur in the stative aspect and take neuter gendered pronouns. A bare example verb is included in (13) below. The choice of pronominal series when single-aspect, neuter verbs occur without an incorporated noun is lexically determined by the verb root. The verb root here, /taih/ 'hot', takes the patient series.

(13) *Oʔdáihę:*
o-ʔtáih-ę:
3.SG.N.PAT-$\sqrt{hot}$-STAT

"It is hot." [Dyck et al. 2021]

However, those single-aspect, neuter verbs which occur with a patient series prefix - when without an incorporate - change their series according to a complex set of conditions. One such condition is the prefix series of the incorporate. For example, a minimal pair showing the same verb root as in (13) is given below in (14). In these examples the pronominal prefix changes to the series of the incorporate, agent in (14a), and patient in (14b).

(14) Single Aspect Neuter Verbs and Incorporation

a. *Gạhsǫwạhdadáihę:*
ka-hsǫwạht-a-táih-ę:
3.SG.N.AG-$\sqrt{wire}$-JOIN-$\sqrt{hot}$-STAT

"A hot plate."

b. *Ohnegadáihę:*
o-hnek-a-táih-ę:
3.SG.N.PAT-$\sqrt{water}$-JOIN$\sqrt{hot}$-STAT

"Hot water." [Dyck et al. 2021]

This is in direct contrast to those verbs which can take all three aspects. In the stative, these verbs invariably occur with patient prefixes when there is a single argument. The example set in (15) below gives the same verb root in all three aspects; only the stative in (15c) takes the patient series.

(15) Three Aspect Verb and Series Selection

a. *Degaǫwę́hda:s*
te-kaǫ-węhta:t-s
DU-3.PL.F.AG-$\sqrt{run}$-HAB

"They run."

b. *Degaǫwęhda:t*
te-kaǫ-węhta:t-∅
DU-3.PL.F.AG-$\sqrt{run}$-PUNC

"They might run."

c. *Dewagęhda:dǫh*
te-wak-węhta:t-ǫh
DU-1.SG.PAT-$\sqrt{run}$-STAT

"I have run" [Dyck et al. 2021]

The facts of long-distance dependencies place specific requirements on any model of Gayogo̱hó:nǫˀ syntax. In particular, at some point in the derivation, the pre-pronominal prefixes and the verb root, the modal prefixes and the aspectual suffixes, and the pronominal prefixes and the derived verb stem must be sufficiently local and sufficiently legible to allow for relationships to be established.

The last portion of this section will describe Gayogo̲hó:nǫʔ syntax above the word level. The Northern Iroquoian languages are generally described as being non-configurational (see Hale 1983 for a discussion of this term) in that they have no dominant word order in a discourse-neutral context but are instead ordered according to information structure and pragmatics (Mithun 1979). Indeed, a transitive clause with no incorporation can occur in all six logically possible orders given the right discourse-context, as in example set (16) from Kanien'kéha (Baker 1996: 10).

(16) a. *Sak ranòn:we's* *akotià:tawi*
Sak ra-nonwe'-s ako-tia'tawi
Sak 3.SG.M.AG-$\sqrt{like}$-HAB 3.SG.F.PAT-$\sqrt{dress}$

"Sak likes her dress."

b. *Sak akotià:tawi ranòn:we's*

c. *Ranòn:we's Sak akotià:tawi*

d. *Ranòn:we's akotià:tawi Sak*

e. *Akotià:tawi Sak ranòn:we's*

f. *Akotià:tawi ranòn:we's Sak*

There are a number of restrictions on this freedom in word order beyond discourse-configurationality. Mithun (1992) notes the general tendency for no more than one argument of a verb to appear unincorporated. Decaire, Johns, and Kučerová (2017) add on to this observation by providing data showing that excorporation of incorporable objects is marked and that the discourse requirements for both an excorporated object and an overt subject are rarely met. With these works in mind, it should be noted that data like in (16) is extremely rare outside of elicitation.

In addition to discourse-configurationality, Northern Iroquoian languages are well-known for allowing discontinuity of - presumed - constituents; particularly of nouns and their modifiers and quantifiers. For example, in (17) below from Kanien'kéha, the quantifier akwé:kon 'all' modifies the noun /ohnónhsa/ 'eggs', but they are linearly separated by the verb.

(17) *Akwé:kon wa'etshén:ri'* *ne ohnón:hsa*
akwekon wa'-e-tshenri-' ne o-hnonhs-a'
all FACT-3.SG.FEM.AG-$\sqrt{find}$-PUNC NE 3.SG.N.PAT-$\sqrt{egg}$-NFS

"She found all the eggs." [Baker 1996: 138, with adapted orthography]

The facts of discontinuity and discourse-configurational word order will mean that the arguments of a verb will need to be treated differently in Gayogo̲hó:nǫʔ than they are in familiar analyses of European languages. The assumptions regarding how these are treated will be spelled out in Section 3.2.

This section has given a brief overview of Gayogo̲hó:nǫʔ parts of speech and their morphology, noun incorporation, long-distance dependencies within the verbal complex, and of utterance level syntax. These phenomena inform the basic needs of the syntactic analysis contained within Chapter 5, in particular; that model must be able to create the verbal complex while accounting for noun incorporation, and while allowing for long-distance dependencies, and discourse-configurational word order. We will now turn to the issue of phonological domains within the verbal complex.

2.3 Phonological Domains in the Verb

This section will provide a detailed description of the phonological domains operating on or within the verbal complex, of which there are at least five, here named for the

portion of the morphosyntax impacted: the noun-verb bundle, the verb stem, the prefix-verb stem boundary, the verbal complex, and there is a utterance-level above that. These layered domains are described in Figure (2.1) below (Dyck 2009).

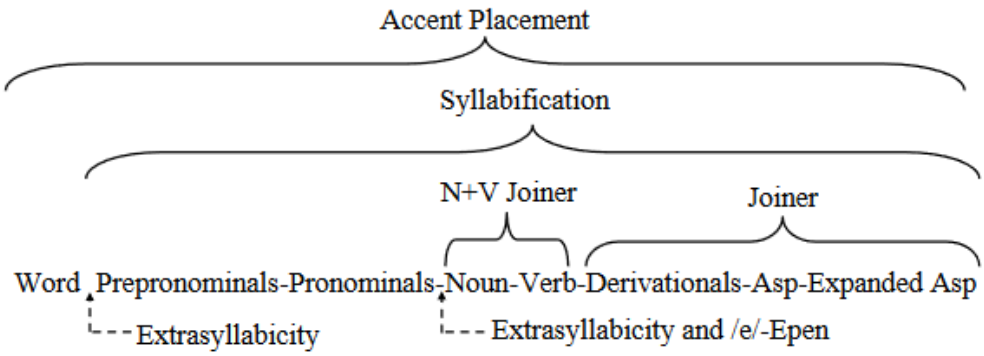


Figure 2.1: Phonological Domains in Gayogo̲hó:nǫʔ

This section will proceed from the smallest to the largest domain; beginning with the noun-verb bundle. The noun-verb bundle is phonologically definable by its specific instantiation of Joiner Epenthesis. The joiner vowel phenomenon was first identified by Chafe (1977) though the phenomenon was most extensively analysed in the cross-Lake Iroquoian context by Michelson (1988), and has been treated extensively in Gayogo̲hó:nǫʔ specifically by Dyck (1990, 1997, 1999, 2009). The phenomenon is an epenthesis operation where /a/ is inserted to resolve an illicit consonant cluster at a morpheme boundary in the verb stem. However, the rules of which clusters are illicit differ from the noun-verb bundle to the rest of the verb stem. In the noun-verb bundle, joiner epenthesis occurs between any consonant cluster at the morpheme boundary between the noun and the verb (Michelson 1988, Dyck 1990). In (18) below, the joiner breaks up the /tj/ cluster at the boundary between the incorporate /hǫt/ 'whip' and the verb root *-yęht-* 'strike'. Note that in this thesis while epenthetic vowels are glossed on the morpheme-by-morpheme level as JOIN and EPEN, they are not argued to be morphological and these glosses are merely for the sake of clarity.

(18) *Ę́kehǫdá:yę́ht*
ę-khe-hǫt-a-yę́ht-ʔ
FUT-1.SG:3.F-$\sqrt{whip}$-JOIN-$\sqrt{strike}$-PUNC

"I will whip her/someone." [Froman et al. 2002: 367]

As noted above, the verb stem apart from the noun-verb bundle is also defined phonologically by the joiner vowel, however it can be differentiated from the noun-verb domain in that it targets a subset of clusters rather than all of them. The process occurs at a boundary between the verb root and any suffix or between any suffix and another suffix. An example of joiner epenthesis is included in (19) where the joiner vowel occurs between the verb root /ot/ and the instrumental suffix /hkhwaʔ/.

(19) *Ǫdenyatsódą̲hkwaʔ*
ǫ-at-e-nyatsh-ot-a-hkhwaʔ
3.SG.F.AG-SRF-EPEN-$\sqrt{braid}$-$\sqrt{be.standing}$-JOIN-INST

"A bobby pin, barrette." [Dyck 2009: 583]

The data showing that the noun-verb bundle is part of a different phonological domain than the verb stem can be found by comparing the data contained in (20), repeated from (2).

(20) a. *Enakdowé:ktaʔ*
e-nakt-owe:k-t-haʔ
3.SG.INDEF.AG-$\sqrt{bed}$-$\sqrt{cover}$-CAUS-HAB

"A bedspread." [Froman et al. 2002: 26]

b. *Odrehdagayǫhgéha:ʔ*
o-treht-a-kayǫh-keha:ʔ
3.SG.N.PAT-$\sqrt{car}$-JOIN-$\sqrt{old.thing}$-CUST

"An antique car." (Lit. It is like an old car) [Froman et al. 2002: 47]

In (20a), the /htk/ is not broken up at the verb root-modifier suffix boundary while in the parallel cluster in (20b), it is. The underlying phonological strings are comparable, and so the difference in surface forms must be driven by them being in different, morphologically-defined domains.

As a final note on the N+V bundle joiner epenthesis, some evidence should be given pointing to this process being actually epenthesis and not a linker vowel as in Germanic compounds (see Nübling & Szczepaniak 2008 on German and Booij 2002 on Dutch). Some Germanic languages insert grammatically vacuous morphemes between morphemes in compounds. Some examples from German are included in (21) below, where LINK is the linking vowel.

(21) a. *Kinderwagen*
kind-er-wagen
$\sqrt{child}$-LINK-$\sqrt{cart}$

"A stroller/pram" [Nübling & Szczepaniak 2008: 3]

b. *Kindeswohl*
kind-es-wohl
$\sqrt{child}$-LINK-$\sqrt{welfare}$

"Child's welfare" [Nübling & Szczepaniak 2008: 3]

c. *Haustür*
haus-tür
$\sqrt{house}$-$\sqrt{door}$

"Front door" [Nübling & Szczepaniak 2008: 2]

In (21), there are three examples all with different allomorphic realisations of the linker. The pair in (21a) and (21b) show that despite being in the same phonological context - /t_w/ - the linker morpheme surfaces as $\langle -er- \rangle$ and $\langle -es- \rangle$, respectively.

Example (21c) shows that a compound can even have no overt linker at all. Nübling and Szczepaniak (2008) summarise the findings of previous work on the linker in German and find that the choice in linker is conditioned by the synchronic gender and declension of the first noun, frozen inflectional morphology, and on phonology. Further studies of compound linkers in Indo-European language families such as Romance, Slavic, and Greek have shown similar historical effects and featural sensitivity (see Harðarson 2020 for a detailed summary).

While noun incorporation can be seen as a variety of compounding (see Mithun 1984 for example), the N+V joiner vowel can be argued not to be an instantiation of a Germanic-style linking vowel for at least two reasons. First, there is no evidence for historical or featural effects on the N+V joiner vowel; the vowel surfaces the same regardless of which roots it is adjacent to or if it occurs after the nominaliser, and it cannot be connected to a historical inflectional morpheme. Second, unlike the examples cited in Harðarson (2020), the N+V joiner vowel is predictable from its local phonological environment; there is epenthesis when there is a consonant cluster across a morpheme boundary. It is therefore assumed in this thesis that the N+V joiner is epenthesis and not a linker vowel in the Germanic sense.

The next domain is that of /e/-Epenthesis which occurs exclusively between the pronominal prefixes and a right-adjacent root, whether that root is the incorporated noun or the verb (Michelson 1988). It does not occur between prefixes and each other, though the phonological conditioning for /e/-Epenthesis would never be met by the prefixes regardless and so the process' productivity across the domain is inconclusive (see Dyck et al. 2014, 2021 for an exhaustive listing of the prefixes). Just like joiner epenthesis, this operation resolves illicit consonant clusters, though it targets only a subset of all clusters rather than all clusters. The clusters targeted are phonologically

the exact same as in verb stem joiner epenthesis. Two examples are included in (22), below. In (22a), the cluster /hsk/ at the boundary between the pronominal prefix /hehs/ and the verb root /kę/ is resolved with /e/-Epenthesis. Similarly, when the nearest prefix at this boundary is a reflexive or semireflexive, the epenthesis appears at its right-edge, as in (22b).

(22) a. *Ęhehsé:gę?*
ę-hehs-e-kę-ʔ
FUT-2.SG:3.SG.M-EPEN-$\sqrt{see}$-PUNC

"You will see him." [Dyck 1990: 36]

b. *Ęhsadewá:yę:s*
ę-hs-at-e-wayęs-ø
FUT-2.SG.AG-SRF-EPEN-$\sqrt{learn}$-PUNC

"You will learn." [Froman et al. 2002: 180]

The /e/-Epenthesis operation does not target clusters internal to a morpheme. Compare (22a) with (23) below. In (23), the /hsk/ cluster which is targeted in (22a) goes unresolved because it does not occur at the boundary between morphemes.

(23) *Ohsgoha?*
o-hskoh-aʔ
3.SG.N.PAT-$\sqrt{large.branch}$-NFS

"A large branch." [Froman et al. 2002: 567]

Critically, joiner epenthesis and /e/-Epenthesis are in mutually exclusive domains. The minimal pair in (24), repeated from (1), below shows that while both epenthesis operations act on an overlapping set of phonological contexts, here this context is specifically /t_tr/, they occur in different morphological contexts. In (24a), the

/t_tr/ cluster appears at the boundary between the semi-reflexive and the incorporated noun. In (24b), this cluster occurs between the verb root and the purposive suffix.

(24) The Joiner and /e/-Epenthesis Operate in Different Domains

a. *Odedrę́nái?*
o-at-e-trę-a-i?
3.SG.N.PAT-SRF-EPEN-$\sqrt{odour}$-$\sqrt{be.stuck.on.something}$-PUNC

"An odour." [Dyck 2009: 581]

b. *Swagwiyáędadrę?*
s-wak-wiy-a-ęt-a-tr-ę?
REP-1.SG.PAT-$\sqrt{child}$-JOIN-$\sqrt{have}$.CAUS-JOIN-PURP-PUNC

"I am going to have another child." [Dyck et al. 2021]

Beyond the epenthesis operations, there are two other sets of phenomena which are relevant to establishing phonological domains: extrasyllabic consonants, and accent phenomena. These will define the (sub)word level and the word level. They will be dealt with in turn in the reminder of this section.

Cayuga allows for consonants - called extrasyllabic consonants - to be unsyllabified in highly restricted, morphologically conditioned environments (Dyck 2009; and see Harris 1983 and Hayes 1995 for general discussion of extrasyllabic consonants). These unsyllabified consonants occur at the left edge of nouns, verb stems, verbal complexes, and a few larger particles. The example set below in (25) provides examples of extrasyllabicity in each category, respectively.

(25) Extrasyllabicity Across Categories and Positions

a. *K.dagǫʔ*
ktakǫʔ
$\sqrt{squirrel}$

"A squirrel." [Dyck 2009: 584]

b. *It.k.daʔk*
i-t-k-taʔ-k
PART-CIS-1.SG.AG-$\sqrt{stand.up}$-MOD

"I was standing there." [Mithun & Henry 1984: 567]

c. *T.gahe:ʔ*
t-ka-he:ʔ
CIS-3.SG.Z.AG-$\sqrt{sit}$.HAB

"It is sitting over there." [Dyck 2009: 585]

d. *T.gwęhę:ʔ*
tkwęhę:ʔ
$\sqrt{sometimes}$

"Sometimes." [Dyck 2009: 586]

Dyck (2009) argues that this phenomenon is the defining characteristic of the prosodic word domain, which will be discussed in Chapter 3 below. The last and largest domain relevant to this work is that of accent/stress placement and 'Laryngeal Metathesis.' While the placement and effects of stress are complex, in short stress placement is driven by iterative, left-to-right, iambic footing with primary stress generally falling on the penult or antepenult on utterance final words and otherwise on the final syllable (Foster 1982; see also Chafe 1977, Dyck 1997, 2009, Michelson 1988 among others). The phonetic correlate of primary stress is pitch accent (Doherty 1993; Williams 2013). Example (26) below is a minimal pair showing the placement

of pitch accent relative to position in the utterance. In example (26a), one can see the verb 'Aga:tǫ:dé^{ʔ}' is not utterance final and has a word-final pitch accent - shown by the acute accent on the vowel. When this same word is in utterance final position - as in (26b) - the accent moves to the penultimate vowel. Stress positioning then requires a domain larger than the word's domain.

(26) Accent Placement by Position

a. *Aga:tǫ:dé^{ʔ}* *tsǫ:*
a^{ʔ}-k-a-thǫ:te^{ʔ} tshǫ:
FACT-1.SG.PAT-JOIN-$\sqrt{hear}$.PUNC just

"I just heard it." [Froman et al. 2002: xxxiii]

b. *Negitsǫ́:* *aga:tǫ́:de^{ʔ}*
nekitshǫ: a^{ʔ}-k-a-thǫ:te^{ʔ}
just FACT-1.SG.PAT-JOIN-$\sqrt{hear}$.PUNC

"I just heard it." [Froman et al. 2002: xxxiii]

Creaky voicing and vowel devoicing also make reference to the foot. These allophonic phenomena are a form of feature spreading in prosodically weak syllables (mis)named 'Laryngeal Metathesis' in the literature (Dyck 2009; see also Chafe 1977, Doherty 1993, Foster 1974, 1982, Lounsbury 1963). To illustrate, consider the minimal pair in (27). Iambic footing is established iteratively from left to right, accounting for the distinction between pre-accent, metrically strong or weak syllables. However, pitch accent placement is computed from the right edge (see Michelson 1988 for details). All vowels have normal phonation in the citation form in (27a). However, when the pronominal prefix is changed, as in (27b), the first and third syllables are put in weak positions relative to the iambic feet, and their vowels have right adjacent laryngeals, and so they become creaky and devoiced, respectively. As is the norm in

the Henry Orthography, this is shown by the underlining of the vowels in creaky and devoiced syllables.

(27) Vowel Devoicing

a. *(Ǫ.gwaʔ).(ni.gǫ́).haʔ*
ǫkwa-ʔnikǫh-aʔ
3.PL.F.PAT-$\sqrt{mind}$-STAT

"Our minds." [Dyck 2009:576]

b. *(Gaʔ.ní).(gǫ.haʔ)*
ka-ʔnikǫh-aʔ
N-$\sqrt{mind}$-STAT

"A mind." [Dyck 2009: 575]

This section has described the multiple, layered, phonological domains of the verbal complex. The phonological processes described above have themselves been analysed in Michelson (1988) and Dyck (1990, 1999, 2009), among others, and will not be the focus of this thesis. Instead, this work will attempt to derive the domains of the processes - the morphologically defined extents of the material they target - through a model of Gayogo̲hó:nǫʔ morphosyntax.

Chapter 3

Previous Analyses

This chapter will discuss previous analyses of the data presented in Chapter 2. This data has been analysed through a completely phonological lens by Michelson (1988) and by Dyck (1990, 1999, 2009), and through a morphosyntactic lens by Barrie (2018). In addressing the Barrie (2018) analysis, there will also be a look at the Generative models of Northern Iroquoian verb stems which inform the analysis presented in Chapter 5. The phonological analyses will be treated first, followed by the morphosyntactic.

3.1 Phonological Analyses

This section will detail the work presented in Michelson (1988) and Dyck (1990, 1999, 2009) in analysing the domains of epenthesis, extrasyllabicity, and accent phenomena in Gayogo̱hó:nǫʔ. For other theoretical analyses see Prince (1983) and Benger (1984, 1985).

Michelson (1988) represents the first systematic, theoretical analysis of epenthesis domains and accent placement in Five Nations Iroquoian. This work is situated within

a Rules-Based Phonology (SPE Rules: Chomsky & Halle 1968), which models the phonological portion of the grammar as a set of ordered rules, and the CV Phonology framework (Clements & Keyser 1983), which is a model of how phonological strings are organised in the grammar. The CV Phonology framework asserts that the prosodic structure is hierarchical and made up of several tiers. An example of this formalism is included in the diagram below for the word <Ohshéʔaʔ> found in (7). Note that the inclusion of glottal codas within a branching nucleus is based on interactions between vowel length, stress, and the glottal segment, and is well-established within the Northern Iroquoian phonological literature (Michelson 1988, Bonneau 1988 among others).

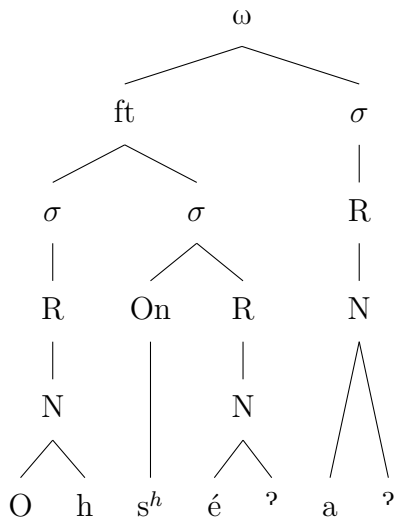


Figure 3.1: Cayuga and CV Phonology

This framework has the advantage of differentiating the prosodic word from its component parts, the foot from its component parts, and so on such that a rule can target any relevant level to the exclusion of all other levels. Michelson (1988) uses this articulated structure along with SPE rules to target sites of epenthesis and feet for insertion of epenthetic vowels and accent. For example, Michelson (1988: 25) provides the following rule for one-type /e/-Epenthesis:

(28) $\varnothing \rightarrow e \ / \ k\_k$

Notice that one would have to specify the morphological context that this rule applies in; otherwise /kk/ clusters would be broken up throughout the language, contrary to the data. Although Michelson (1988) does not formalise this for Gayogo̲hó:nǫʔ, she does provide some indication for how this would be done in her analysis of Kanien'kéha Joiner Epenthesis. Just like in Gayogo̲hó:nǫʔ, joiner epenthesis occurs at morpheme boundaries in the verb stem when the boundary has an illegal cluster. Kanien'kéha Postaccent Joiner Epenthesis is formalised by Michelson (1988: 160) as:

(29) $\varnothing \rightarrow a \ / \ C\_C$

Condition: applies at specified boundaries.

In this particular example, the specified boundaries would need to be a listed set of morpheme boundaries which condition Joiner Epenthesis, to the exclusion of /e/-Epenthesis, and the latter rule would have to be specified similarly. Michelson (1988) orders these and others relative to one another which further constricts how broadly each rules applies; as the string goes from the input to the first rule to the last it is manipulated such that the clusters which would be broken up by higher rules are broken up earlier. Her model of Northern Iroquoian epenthesis and accent is able to account for the system solely within the phonological portion of the grammar. However, due to the period the study was written in and because its goal is to describe Northern Iroquoian phonology, it misses some of the core morphosyntactic generalisations about the domains of epenthesis which - as this thesis will argue - are the root of the layered nature of the system.

Dyck (1990) builds on Michelson's (1988) work in providing a theoretical account

of Gayogo̲hó:nǫʔ epenthesis. Unlike Michelson (1988), Dyck (1990; and subsequent works) introduces the notion of cyclicity into the model of Gayogo̲hó:nǫʔ phonology by situating her work within Lexical Phonology (Kiparsky 1981). This theory proposes that the phonological portion of the grammar is arranged in different, morphologically-defined levels, modelled in Gayogo̲hó:nǫʔ as the level of derivation - the verb stem - and the word level (Dyck 1990: 14). The theory further proposes that the levels are strictly ordered and that all rules apply at the first level but that a subset of phonological rules apply in further levels (for more information on Lexical Phonology see Kiparsky 1981, 1985). Dyck (1990) uses this theory in conjugation with the Prosodic Phonology framework (the work of Itô 1986 in particular) which is a manner of organising phonological strings that assumes much of the CV Phonology framework though crucially assumes that epenthesis is driven by the need to have connections from all segmental nodes to higher nodes (The Prosodic Licensing Constraint: Itô 1986).

In brief, Dyck (1990) argues that Structure Preservation (McCarthy & Prince 1986, Kiparsky 1985) and the vowel inventory interact to derive which vowel is inserted; /a/ or /e/. Her analysis is predicated on an argument - which will not be repeated here - that at the derivational level there are only three vowels available, none of which are /e/ (Dyck 1990: 58-60). Due to Structure Preservation, which does not allow for rules to create non-underlying vowels at the derivational level, when the epenthesis rule applies at the derivational level the vowel epenthesised cannot be /e/. Since Structure Preservation is assumed not to hold at the word-level (following Itô 1986), the word-level epenthesis rule can and does insert /e/. This analysis has the benefit of using a morphologically-informed phonology to target the domains of epenthesis. However it does not provide an answer as to why there is a separate domain of epenthesis within the derivational level, as in the noun-verb bundle, or why the reflexives occur

outside of the derivational domain, in that they occur to the left of /e/-Epenthesis like pronominal prefixes, when they are generally taken to be part of the verb stem (see Barrie & Mathieu 2016 for discussion). Instead, it predicts that there should be no difference between the phonological environments targeted by the two joiner epenthesis operations and that the reflexives, as derivational morphemes, should not appear to the left of /e/-Epenthesis; both predictions are contrary to the data.

Dyck (2009) further develops the understanding of domain layering within the Gayogo̲hó:nǫʔ word by providing evidence and argumentation towards a word domain and an intonation phrase domain corresponding to a portion of the verbal complex and the whole of the verbal complex, respectively. Dyck (2009) begins her study by drawing attention to the fact that extrasyllabic consonants appear at the left edge of the noun, verbal complex, and some particles, but also internal to the verbal complex, as in (25). That there is an extrasyllabic position word-internal is contrary to the widely understood principle that unsyllabified material occurs peripherally (The Peripherality Constraint: Harris 1983 and Hayes 1995). Dyck (2009) argues that the mediality of the extrasyllabicity in the verbal complex is not a counter-example to the Perpherality Constraint because it occurs in the same place that the extrasyllabic consonant would occur if there were no prepronominal prefixes; at the boundary between the pronominal prefix and the verb stem. These extrasyllabic consonants then are delimiting a phonological domain which is not definable by any other phonological process. Additionally, she shows that the domain of extrasyllabicity cannot be defined as being an XP or X^{o} because those particles which take extrasyllabic consonants must be roots - like in (25d) - and any verbal complex which takes an extrasyllabic consonant is obligatorily a phrase (see Figure 2.4). Since the domain cannot be defined according to these syntactic categories, she turns to prosodic domains.

Following Selkirk (1978), McCarthy and Prince (1986), and Nespor and Vogel (1986), Dyck (2009: 596) considers the relevant prosodic hierarchy from largest to smallest to be: the Intonation Phrase, the Phonological Phrase, and the Prosodic Word. Since the relevant domains can only be described prosodically, and the smallest domain is that of extrasyllabic consonants, Dyck (2009) concludes that the domain defined by extrasyllabic consonants is the prosodic word, and the domain defined by syllabification is the phonological phrase. For Dyck (2009: 602), then, the verbal complex in Gayogo̲hó:nǫʔ is a phonological phrase which can include within it more than one prosodic word.

The phonological analyses presented here show a clear trend towards greater reliance on and reference to morphosyntactic structures. In Michelson (1988), beyond using morphosyntactic structure as a means for describing the extents of phonological phenomena, there is no role for the morphosyntax as a driver of the phonology. In Dyck (1990), there is reference to the syntactic reality of cyclicity and the nature of the prefixal vs. verb stem domains through the use of Lexical Phonology. Last, Dyck (2009) makes explicit that there is morphosyntactic regularity in the phonology - via the placement and domains of epenthesis. The work presented in Section 3.2 is a natural extension of this trend towards a greater reliance on the morphosyntax in defining the extents of Gayogo̲hó:nǫʔ phonological domains. This review will now turn to previous morphosyntactic analyses of Northern Iroquoian, before addressing Barrie's (2018) analysis.

3.2 Morphosyntactic Analyses

This section will provide a review of proposals in the Generative literature for building the verb stem in Northern Iroquoian and, after having set the stage, will present the most recent analysis of phonological domains in Gayogo̱hó:nǫʔ.

The traditional position is represented by Baker's (1984, 1988, 1996, 2009) Head Movement analysis. Building from the Government and Binding (Chomsky 1981, 1982) syntactic tradition, Baker argues that incorporation structures such as those in (10) are created in the course of the morphosyntactic derivation as opposed to in the Lexicon (contra Mithun 1984, 1986a). Specifically, he argues that the verb stem - and the incorporation structure therein - in Kanien'kéha (Mohawk: Northern Iroquoian) is created by cyclic head movement (most recently restated for Mapudungun in Baker 2009). To illustrate his theory, below is a Kanien'kéha minimal pair of a noun unincorporated and incorporated.

(30) Noun Incorporation Minimal Pair in Kanien'kéha

a. *Wa'khní:non'* *ne* *kanákta'*
wa'-k-hninon-' ne ka-nakt-a'
FACT-1.SG.AG-$\sqrt{buy}$-PUNC NE 3.SG.N.AG-$\sqrt{bed}$-NFS

"I bought a bed."

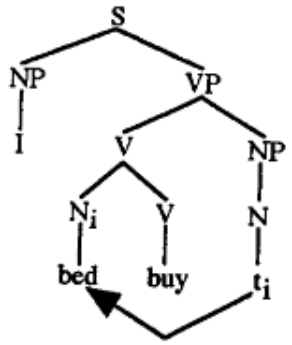
b. *Wa'kenaktahní:non'*
wa'-k-e-nakt-a-hninon-'
FACT-1.SG.AG-EPEN-$\sqrt{bed}$-JOIN-$\sqrt{buy}$-PUNC

"I bought a bed." [modified orthography from Baker 1996: 279]

In (30) above, the noun root $\sqrt{nakt}$ 'bed' first occurs unincorporated with a pronominal prefix and a noun-forming suffix. When it is incorporated, however,

it appears as a bare root. Following Baker's (1985) Mirror Principle, which states that the surface-order of morphemes must reflect the underlying syntactic order, the underlying order of the verb stem in (30b) is informally AspP-VP-NP. To derive the noun-verb bundle, Baker (1988, 1996) first merges the noun as the sister of the verb, in Comp, VP, according to the Uniformity of Theta Role Assignment Hypothesis (UTAH: Baker 1988, 1997). The bare noun root then undergoes head-movement to the verb root, creating a complex, derived head, as in (31) below.

(31)



Baker (1996: 17-20) argues that this movement is due to a Parameter setting called the Morphological Visibility Condition which requires that an argument must be coindexed with a morpheme on its theta-role assigner for the argument to be assigned a theta-role; in this case that coindexation is achieved through movement. This thesis does not assume this parameter setting, or a parametric model of the grammar generally, and so the Morphological Visibility Condition will not be discussed further.

Baker's (1988, 1996) argument for head movement - as opposed to the myriad of other options which have been proposed - is predicated on the incorporate being a bare noun and not the NP/DP sized standalone noun like *kanákta* 'bed' in (30a).

In addition to the incorporation of bare roots, Baker (1988) brings evidence that incorporating a noun can strand DP material, creating discontinuous dependencies. An example from Kanien'kéha is included in (32) below.

(32) a. *Karà:ken* *thí:ken* *kanónhsa'*
ka-raken thiken ka-nonhs-a'
3.SG.N.AG-$\sqrt{be.white}$ that 3.SG.N.AG-$\sqrt{house}$-NFS

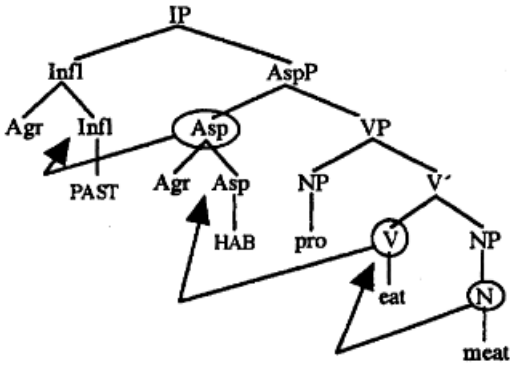
"That house is white."

b. *Kanonhsrá:ken* *thí:ken*
ka-nonhs-raken thiken
3.SG.N.AG-$\sqrt{house}$-$\sqrt{be.white}$ that

"That house is white." [Postal 1962: 395 by way of Baker 1996]

The example set in (32), shows that a determiner and the noun it modifies can be made discontinuous under noun incorporation. In Kanien'kéha, and all other Northern Iroquoian languages, a modifier cannot incorporate with the noun (Mithun 1984, 1986a). Baker (1988, 1996, 2009) took this and other similar data to mean that the incorporate could be no larger than a head, and since incorporation is a syntactic process it must therefore be head movement. For completeness, Baker (1988, 1996) assumes that the rest of the Northern Iroquoian verb stem is also derived by cyclic head movement. He models this as in the tree for the verb stem *-'wahrakskwe'-* 'used to eat meat' in (33) below (Baker 1996: 31).

(33)



Baker's Head Movement analysis - perhaps even more so than the Polysynthesis Parameter itself - has proven highly influential even while head movement as a core syntactic process has been strongly challenged in Minimalism. Following the introduction of Bare Phrase Structure (BPS: Chomsky 1995, 1996) there was a groundswell of subsequent work dismantling head movement as a possible operation (see Chomsky 2001 for foundational objections; see also Roberts 2011 for an overview of this debate). Building on this work, Barrie and Mathieu (2012, 2016) argue for modelling noun incorporation in Northern Iroquoian and Algonquin as phrasal movement. The crux of their argument is that the incorporated noun in Northern Iroquoian can be larger than a bare root; contra the data presented in Baker (1988, 1996, 2009). To illustrate, Barrie and Mathieu (2016) present data showing that the incorporated noun can include a nominaliser, as in (11) repeated below as (34a), with a citation form for the verb without the nominaliser presented in (34b).

(34) a. *Syadǫhsráędí*ʔ
s-hyatǫ-hsr-a-yętei-ʔ
2.SG.AG-$\sqrt{write}$-NLZR-JOIN-$\sqrt{know}$-HAB

"You are smart." [Froman et al. 2002: 300]

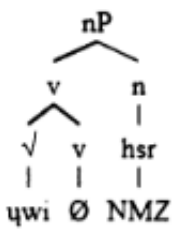
b. *Ehyá:dǫh*
e-hyatǫ-h
3.SG.F.AG-$\sqrt{write}$-HAB

"She writes." [Froman et al. 2002: 375]

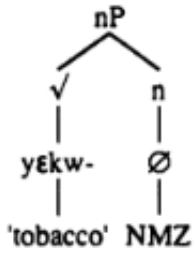
Barrie and Mathieu (2012, 2016) use data like this to argue that, while noun incorporation is indeed syntactic, it is not head movement and must be phrasal. Their phrasal analysis is couched within BPS (Chomsky 1996) and Distributed Morphology (henceforth DM: Halle & Marantz 1993). They begin with the common DM assumption that all roots come to the syntactic derivation without category and must be categorised by another head; *n*, *v*, etc (Marantz 1997). They argue that since there are roots which must appear with a nominaliser to incorporate, and the incorporate can be no larger than an nP, it must be that the verb is targeting an nP for incorporation (Barrie & Mathieu 2016: 29-30). Following the work of Maratnz (1997) and Borer (2003, 2005a,b), they begin their syntactic derivation by merging the root with the *n* head. Barrie and Mathieu (2016: 29) provide the following example trees where in (35a) the root /ųwi/ 'breathe' in Onǫda'gegá' is first merged with a *v* then with an *n*, in (35b), however, the root /yɛkw/ is merged directly with the *n* categorising head (Barrie & Mathieu 2016: 29). The authors give no indication as to why the root /ųwi/ must first concatenate with a categorising *v*. If all roots are uncategorised when they enter the derivation and both must take *n* categorisation to participate in incorporation, then there should be no reason for this extra step (see Barrie & Jung 2020 for an alternative view on root categorisation in Northern Iroquoian).

(35)

a.



b.



For the rest of the derivation of the verb stem, the authors follow Barrie (2011). This work argues that noun incorporation follows from the Linear Correspondence Axiom (henceforth LCA: Kayne 1994) which states - informally - that linear order is established by asymmetric c-command and that specifically a head asymmetrically c-commanding another will be ordered before the other. In particular, Barrie (2011) adopts the Dynamic Antisymmetry framework (Moro 2000) which holds that linearisation according to the LCA is an active principle in the syntax, ie; when a c-command symmetry arises such that linearisation cannot occur, it must be resolved immediately. The verbal complex which Barrie (2011) models is from Onyota'a:ká, and is included below for clarity. Its morphosyntactic structure is analogous to the Gayogo̲hó:nǫʔ translation, as would be expected from any Northern Iroquoian language. Structures like this, with a non-incorporated noun and a coreferenced incorporated noun, will be discussed further in Section 3.3.

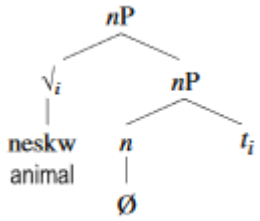
(36) *Waʔkneskwahni:nú:* *é:lhal*
waʔ-k-neskw-a-hni:nú-:' é:lhal
FACT-1.SG.AG-$\sqrt{domestic.animal}$-JOIN-$\sqrt{buy}$-PUNC $\sqrt{dog}$

"I bought a dog." [Barrie 2011: 115]

In Barrie's (2011) model of Northern Iroquoian noun incorporation, when the

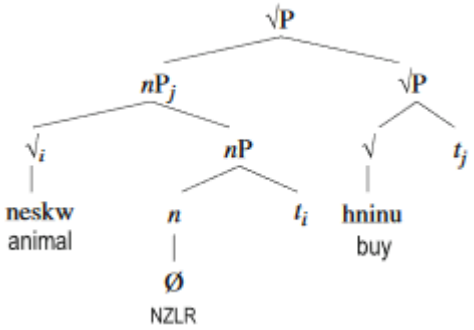
root is merged with the categorising head n as in (35b), the structure results in symmetrical c-command between the heads. Barrie (2011) argues that this symmetry must be repaired and that the repair must be to move the root to Spec, nP, as in the structure in (37) (Barrie 2011: 115).

(37)



This derived nP is then merged with the (verb) root to form a √P. This also results in symmetrical c-command, this time between the (verb) root and the nP. The resolution for Barrie (2011: 115) is again to raise the complement to Spec,√P, as shown in (38) below.

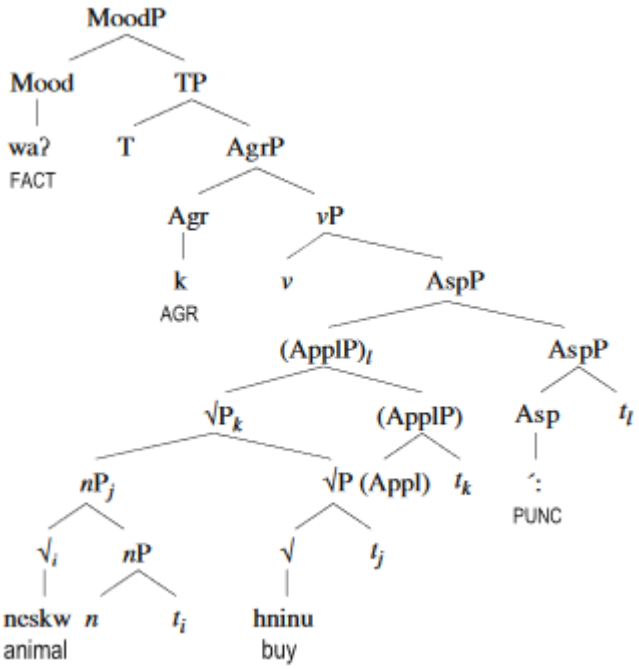
(38)



From this position, Barrie (2011) is able to address the rest of the verb stem. He follows the Mirror Principle in merging the - hypothetical, as this verbal complex

does not happen to have one - Appl head above the √P. The result is symmetrical c-command and raising of the √P to Spec, ApplP follows. The Asp head is merged with this ApplP, and the now familiar raising to Spec, AspP of the ApplP follows. Once the *v* is merged with AspP, however, this pattern ends as Barrie (2011) argues that, despite the root /neskw/ and *v* being in symmetrical c-command, the *v* head has no phonological content and so does not need to be linearised. Why this would be the case but linearisation of the null nominaliser is required is not explained. This is especially strange, as Barrie (2011: 115) is clear in stating that the lack of phonological material in the nominaliser head would not be seen by the syntactic machinery, as phonological material is only added at PF according to Late Insertion (Halle & Marantz 1993). Regardless, the rest of the verbal complex then is merged in surface order. The final tree is included below in (39) (Barrie 2011: 116).

(39)



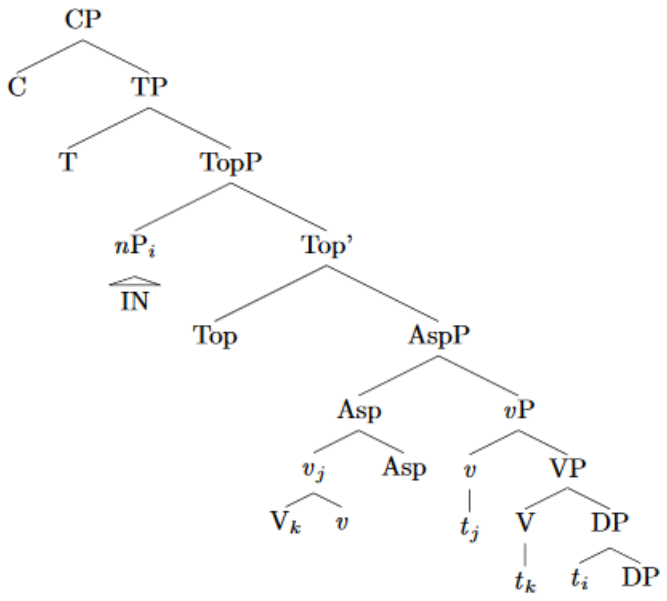
Barrie (2011) and Barrie and Mathieu (2012, 2016), then hold that noun incorporation is a syntactic phenomenon, that it targets the noun phrase, and that it occurs because of the need for linearisation at PF. While they agree with Baker's (1988, 1996, 2009) assertion that incorporation is syntactic, they otherwise present a stark alternative to the head movement approach in how they model roots, the syntactic identity of the incorporate, and the reason for incorporation. In particular, the approaches make different predictions for what should be able to incorporate and the semantic changes which result from that incorporation. For the purposes of this thesis, the phrasal movement approach will be assumed on the basis of the arguments presented in Barrie and Mathieu (2016).

Barrie (2011) and Barrie and Mathieu's (2012, 2016) approach was recently extended by Barrie (2018) in attempting to derive some of the phonological domains discussed in Section 2.3. In this work he proposes that the external argument introducing v-Phase (Chomsky 1995, 2001) is the domain in which joiner epenthesis occurs and that the nP and vP correspond to the prosodic word domain - the domain of extrasyllabicity - identified by Dyck (2009).

Barrie (2018) begins his brief discussion by arguing for a new model of phrasal noun incorporation where the nP is raised to a Topic Phrase above the vP. His argument hinges on the semantic nature of noun incorporation in Northern Iroquoian; it is usually used for backgrounding (Mithun 1984, Woodbury 1975a,b). He connects this with literature by Jayaseelan (2001) and Belletti (2004) arguing for a topic position somewhere below IP and proposes that the incorporated noun moves to the specifier of this TopP. The N+V joiner epenthesis - as distinct from verb stem joiner epenthesis - is accounted for as being the spell-out of the low TopP head. The remainder of the verb phrase under this model is created through head movement and an appeal

to Phase Extension (den Dikken 2007). The nP in Spec,TopP, the verb stem built through head movement, and the prefixes are proposed to be phases which - one assumes - correspond to different rules or strata in the phonological portion of the grammar. Barrie (2018: 10) provides the following tree - in (40) - to show how this sketch would work.

(40)



Barrie (2018: 10) supposes that this model produces three domains which can host extrasyllabic consonants, which are included in (41) below.

(41) [CP Mood-Agr][nP IN][vP V-Caus-Asp]

This analysis provides some groundwork for understanding how phases can account for phonological domains in Gayogo̲hó:nǫ̀ʔ. However, it has a number of shortcomings which will be important for this thesis to address. This will be the topic of the next subsection.

3.3 Problems for Barrie's Analysis

Barrie (2018) presents two important points which will figure heavily in this thesis' analysis, in particular: that the vP is the domain of Joiner Epenthesis, and that CP is the domain of /e/-Epenthesis. However, there are some non-trivial problems in Barrie (2018) which will need to be addressed in some way over the course of this present work, namely: that not all nouns incorporate for backgrounding, that non-backgrounded incorporates undergo the same epenthesis operations as those which are backgrounded, and that the move raising the nP to Spec, TopP breaks the Phase Impenetrability Condition (PIC: Chomsky 1995, 2001).

First, while it is true that some nouns are incorporated because they are backgrounded, this is not the case of all incorporates. Incorporation can also be used to classify an object (Mithun's 1984 type IV incorporation). In the Onǫda'gegá' example in (42) below, the word for melon is left unincorporated while the stem for generic squash, melon, pumpkin, etc. (here glossed as $\sqrt{squash}$) is incorporated into the verb. In this case, the object's root can be incorporated but there is greater specificity given by the non-incorporated form (Woodbury 1975a). How this form of incorporation takes place under Barrie's (2018) model is unclear.

(42) *Waʔhahnyųhsatshęníʔ* *ohnyųhsowá:nę*
waʔ-ha-hnyųhs-a-tshęní-ʔ o-hnyųhs-owá:-nę
FACT-3.SG.M.AG-$\sqrt{squash}$-JOIN-$\sqrt{find}$-PUNC 3.SG.N.PAT-$\sqrt{squash}$-$\sqrt{big}$-ASP

"He found a melon." [Woodbury 1975a: 13]

In addition, one can have incorporation of a root that is clearly different from the root of the nP targeted for incorporation. In (43a) below, the object of the verb is *so:wa:s* 'dog', which is unincorporable. The remedy is to incorporate a non-specific

root which is lexically conditioned by the root of the targeted noun. In (43b), however, the root can take affixation and so could be incorporated. For some reason it is not and instead there is incorporation of the generic root for trees.

(43) a. *Ganahsgwi:yó:* *neʔ* *só:wa:s*
ka-nahskw-i:yó: neʔ só:wa:s
3.SG.N.AG-$\sqrt{domestic.animal}$-$\sqrt{good}$ DET $\sqrt{dog}$

"The dog is a good pet" [Dyck et al. 2021: 101]

b. *Degrahe*ʔ*da:gé:* *ohó:dra*ʔ
te-krahe^{ʔ}t-a:ké: o-hó:tr-a^{ʔ}
DU-3.SG.N.AG.$\sqrt{tree}$-NS.STAT 3.SG.N.PAT-$\sqrt{basswood}$-NFS

"Two basswood trees." [Dyck et al. 2021: 102]

How this data is to be modelled under Barrie's (2018) nP incorporation-as-backgrounding account is not clear in at least two ways. First, while (43a) may indeed be backgrounding, no indication is given in (43b) that this structure is backgrounded. Second, the nPs targeted for incorporation are blocked from doing so (note that because the nouns are of different morphological structures it may be that this happens for different reasons for both nouns) despite being built from roots of the correct size. Assuming a DM framework, it is unclear how to motivate the Spell-out of a different root from the root which is raised, especially since this movement is not motivated by a specific, named feature.

There are also examples of incorporation where the incorporate is a dummy noun. Gayogo̲hó:nǫʔ has several verbs which obligatorily incorporate and will appear with a 'noun' with no semantic content if they cannot incorporate an existing noun (Chafe 1967). The phonological shape of the dummy noun is lexically determined by the verb root. For example, (44) below contains the verb root /ohak/ 'to squeeze' with

an incorporated noun root - as in (44a) and then with the dummy noun root glossed as NOUN - as in (44b).

(44) a. *Degahstrǫdróha:s*
te-ka-hstrǫtr-ohak-s
DU-3.SG.N.AG-$\sqrt{straw}$-$\sqrt{squeeze}$-HAB

"A hay baler."

b. *Dewakdǫ́há:gǫh*
te-wak-t-ohak-ǫh
DU-1.SG.PAT-NOUN-$\sqrt{squeeze}$-STAT

"I am squeezing it." [Dyck et al. 2021: 106]

The incorporated element in (44b) cannot be an instance of backgrounding because there is no nominal element to be incorporated, yet it occurs in complementary distribution with normal incorporation. Unfortunately, no dummy nouns will cause Joiner Epenthesis with their verbs because no dummy noun-verb pair creates a cluster across a morpheme boundary. Taken with other data showing verb root suppletion conditional on incorporation, dummy incorporation could be argued to be allomorphy. Consider the data in (45) below.

(45) a. *Shę́h niyóyanreʔ*
shęh ni-yo-yanreʔ
how PART-3.SG.N.PAT-$\sqrt{good}$.ASP

"How good it is." [Froman et al. 2002: 138]

b. *Sǫgweʔdí:yo:*
s-ǫgweʔd-í:yo:
2.SG.AG-$\sqrt{person}$-$\sqrt{good}$.STAT

"You are a good person." [Froman et al. 2002: 138]

Both verb roots in (45) are argued to come from the same root (Mithun 1984: 877). Their suppletion is then conditional on whether or not there is an incorporate. Considering the dummy noun incorporation as allomorphy of the verb root in (44) as does Mithun (1984) would provide grounds for a morphological analysis rather than a syntactic one. How this can be done in the analysis proposed here will be mentioned in Chapter 5.

Regardless of how this is analysed, if it is not the case that all noun incorporation is due to raising to Spec, TopP, then Barrie's (2018) model would need to explain why N+V joiner epenthesis always targets any cluster, rather than having the two patterns (no consonant clusters when the noun is backgrounded and normal verb stem joiner epenthesis when it is not backgrounded) which this model would predict.

The key data showing that non-backgrounded incorporates still take joiner epenthesis at the noun-verb boundary is included in (46).

(46) a. *Ohǫna̲ʔdatgę́:* *akǫ́naʔda:k*
o-hǫnaʔt-a-tkę-: a-k-hǫnaʔt-a-k-ø
3.SG.N.PAT-$\sqrt{potato}$-JOIN-$\sqrt{rotten}$-STAT FACT-1.SG.AG-$\sqrt{potato}$-JOIN-$\sqrt{eat}$-PUNC

"I ate a rotten potato." [Mithun 1986b: 386]

b. *Enakdowé:kta*ʔ
e-nakt-owe:k-t-haʔ
3.SG.INDEF.AG-$\sqrt{bed}$-$\sqrt{cover}$-CAUS-HAB

"A bedspread." [Froman et al. 2002: 26]

The example in (46a) has a fronted, foregrounded subject *ohǫna'datgę́:* 'a rotten potato' with an incorporated classificatory √hǫna'd 'potato' noun root in the verb. The incorporation of this root cannot be backgrounding as the potato being referenced is foregrounded (Mithun 1986b, 2005), and so this incorporation cannot be modelled as

raising the noun root to TopP as it would be in Barrie (2018) and must be modelled as raising to some other position. Therefore in (46a) the joiner epenthesis cannot be the head of TopP. Despite this, the /tk/ cluster is broken up by joiner epenthesis, contrary to the prediction in Barrie (2018) that this position should pattern in the verb stem joiner domain and so not have epenthesis, as in the phonologically comparable form in (46b) repeated from (2a). Barrie's (2018) model cannot account for this data without requiring there be another phonological domain driving noun+verb bundle epenthesis. As will be discussed in Chapter 5, the three-phase analysis argued for in this thesis, critically, can cover both backgrounded and non-backgrounded epenthesis data, and so is empirically superior to the epenthesis-as-TopP analysis.

Second, the move to raise nP to Spec, TopP breaks the Phase Impenetrability Condition which states - informally - that the complement of a phase head is not visible to syntactic operations after it has been shipped to the phonological portion of the grammar (Chomsky 2001). While Barrie (2018) follows den Dikken's (2007) Phase Extension theory which allows for the complement of a phase head to be visible until the following phase head is Merged, the nP must pass beyond the next phase, the vP, to get to the TopP. However, Barrie (2018) assumes that the n is a phase head, so after the vP is merged with its VP complement, the nP will be two phases deep and will not be able to be moved any further up the syntactic spine. The move to Spec, TopP must then include an intermediary stage in the vP - so that it will be visible in the Extension of the vP phase - or must be reimagined.

The key issues with Barrie's (2018) analysis are then: that noun incorporation is not solely backgrounding, that all incorporates undergo the same epenthetic process, and that the move to Spec, TopP is not possible under a standard model of Phase Impenetrability.. These issues will figure in Chapter 5. However, prior to attempting an

analysis of the data in Section 2.3, the next chapter will make explicit the theoretical apparatus to be used in this thesis.

Chapter 4

Theoretical Foundations

Having presented the data and a history of its analysis in the previous two chapters, I will now turn to explaining the theoretical apparatus that this thesis will adopt. In brief, the core tenets of Minimalism (Chomsky 1993, 1995, 2001) and Distributed Morphology (Halle & Marantz 1993) form the basis from which the analysis is built. First, in Section 4.1 an overview is provided of the Minimalist framework and the operations and processes which will be assumed. Next, in Section 4.2, Phase Theory (Chomsky 1995, 2001) will be described and a particular model of the theory will be chosen. Then, Distributed Morphology will be discussed in Section 4.3. Last, in Section 4.4, the Phonology by Phase approach (Marvin 2002) will be described as a tradition within which this thesis is couched.

4.1 Minimalism

Minimalism is a research program which coalesced around Chomsky's (1993, 1995) work in the early 1990s. The program has at its foundation the assumption that

there is a space in the mind for holding lexical information (a Lexicon), a recursive computational system which arranges these into meaningful structures (a Syntax), and two parallel systems which deal with the conceptual-logical form of a linguistic structure and its shape in production and perception (Chomsky 1993). The Lexicon is assumed to feed the Syntax which is assumed to feed the conceptual-logical level (called LF) and the production-perception level (called PF). The intersections between the Syntax and LF and PF are called the syntax-semantics interface and the phonosyntactic interface respectively. This model of grammar is called the Y-Model and is represented below in Figure 4.1; note that this model will be revised in Section 4.3.

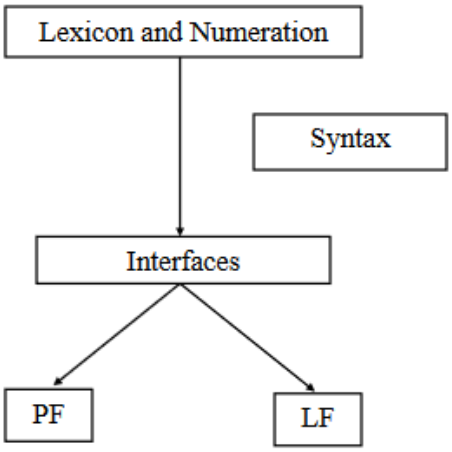


Figure 4.1: The Minimalist Y-Model of the Grammar

Minimalist inquiry is animated by the idea that Language is the ideal response to the conditions at the interfaces, that is, that Language is 'designed' to be maximally efficient given the needs of how the structure-building engine of the Syntax provides information to the conceptual-logical and productive-articulatory systems (The Strong Minimalist Hypothesis: Chomsky 1993). To that end, a great deal of work in the Minimalist canon has been done figuring out what exactly the interface conditions are. This present thesis is very much within this tradition of research in that it is

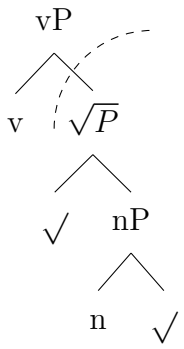
concerned with the interaction between morphosyntax and phonology and therefore with the nature of the phonosyntactic interface.

Syntactic operations in Minimalism are not especially numerous. Principally, the structure building mechanism is Merge which takes two syntactic nodes, combines them, and projects one of the nodes as the head of what is now a phrase (Chomsky 1993; see Fukui 2017 for a recent historical overview). The structure 'changing' mechanism is restricted to (Copy) Move, first proposed in Chomsky (1993), which reimagines the Government and Binding era theory of trace-based movement (see Chomsky 1973) as an operation where a syntactic element - a head or phrase - is copied and the resulting copy is merged higher up (Nunes & Corver 2007). The last major operation to be discussed is that of (Probe-based) Agree (Chomsky 2000, 2001). This operation replaces the Spec, Head relation for feature checking. In this thesis, features are assumed to be either interpretable or uninterpretable (Chomsky 1995), and that uninterpretable features at the interfaces cause the derivation to crash. Agree is one of the methods by which uninterpretable features are made invisible (Chomsky 1995; see Nunes 1995, 1998, 2004 for the extension of this theory to PF). Specifically, Agree is a relationship established between a head (called the Probe) and another head (called the Goal) which allows for specified uninterpretable features on either to be made invisible, ie: to be valued. Canonically, this operation is constrained in at least three ways, all of which are assumed here: the Agree relation must be relative to a feature or set of features, the Probe must c-command the Goal or be c-commanded by the Goal, and the Goal must be the first c-commanded material with the relevant feature (the Defective Intervention Constraint: Chomsky 2000). I assume following Baker (2008), Béjar and Rezac (2009), and Merchant (2006, 2011) that Agree can either be Downward or Upward. Having sketched the Minimalist elements assumed here, the next section will now turn to Phase Theory.

4.2 Phase Theory

The core concept that this thesis is concerned with is the Phase (Chomsky 2001). Gallego (2010: xi) calls phases, "small derivational windows" within which the syntax proceeds. While details in various models differ, the core idea of Phase Theory is that the syntax proceeds until certain heads - traditionally C and the external argument introducing v - are merged, after which that head's complement is shipped to the interfaces and becomes inaccessible to further syntactic operations (the Phase Impenetrability Condition: Chomsky 2001). Example (47) below, provides a tree bleached of lexical information showing where the v phase operates.

(47)



In (47), a root has merged with a categorising n to form an nP. This phrase has merged with another root to form a √P. When this phrase is merged in Comp, vP, it is shipped to the interfaces because the v head is a phase boundary. It will no longer be accessible to the syntax; as represented here by the dashed line.

While the C and the external argument introducing v heads are the ubiquitous phase heads, there are numerous proposals arguing for others. Marantz (2001, 2007) argues that all lexical category forming heads - n, v, and a - are phase heads; note that for the remainder of this thesis, the transitive/external argument introducing v head (Voice) is distinguished from the v head which categorises the root (following

Kratzer 1996). The evidence for this strong assertion comes from morphophonological alternations between lexical and syntactic valency changing phenomena. In brief, Marantz (2001, 2007) draws from the work of Dubinsky and Simango (1996) on inner and outer affixation in Chichewa (Southern Bantu) where morphemes below the verbalising head can form idioms with and cause allomorphic alternations on the verb root, but morphemes outside of the verbalising head cannot do so. Marantz (2007) argues that this shows that the verbalising head forms a barrier - a phase - against interactions between the verb root and material outside of its categorising head. Following this work, I assume that all categorising heads, Voice, and C are phase heads. This will play a key role in the analysis presented in Chapter 5. Last, I assume following Bošković and Nunes (2007) that the Agree operation can hold across phase boundaries.

4.3 Distributed Morphology

Arising in the same time period as Minimalism, Distributed Morphology (DM: Halle & Marantz 1993) also proposed a novel model of the grammar. In DM, morphological processes are distributed across the linguistic system. The Lexicon has been divided into three different portions: a morphosyntatic inventory which holds roots and features and placed such that it feeds the Syntax, a Vocabulary List where terminal nodes of the syntax are associated with phonological material at the phonosyntactic interface, and an Encyclopedia which holds paralinguistic information at the end of the derivation. This updated Y-model is presented below in Figure 4.2.

The model above has a number of implications on how a derivation progresses. First, notice that since there are only roots and features in the syntactic portion of

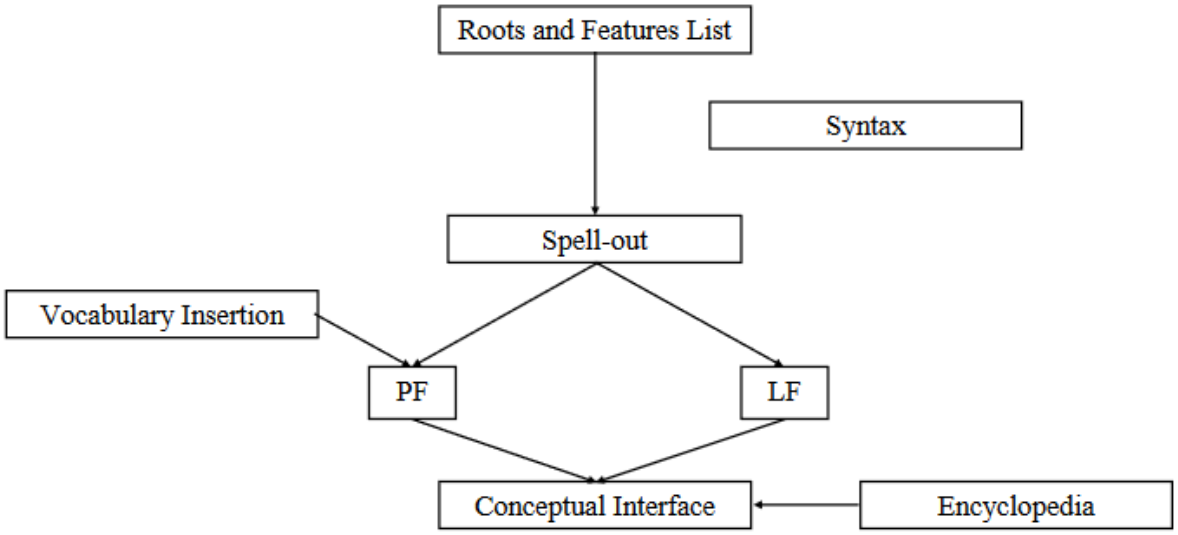


Figure 4.2: The DM Y-Model of the Grammar

the derivation there is no phonological information available to the syntax. Indeed, DM is strictly anti-Lexical (Marantz 1997) in that there is no phonological material prior to Vocabulary Insertion, there is no concept of morpheme or word in the syntax, and that all roots enter the derivation without category. Consequently, all roots must be treated equally with regards to their argument structure, requirements on linear order, etc. I assume that category is obtained by an uncategorised root and the nearest c-commanding categorising head establishing an Agree relation (Harley & Noyer 1999).

The insertion of phonological material in DM - called Vocabulary Insertion - is a highly articulated process. Vocabulary Insertion operates on the terminal nodes of the syntax when they are shipped to PF. Each terminal node is an unordered bundle of features which is matched to phonological material through a competitive system organised from most to least specified according to the Elsewhere Condition (Anderson 1969, Kiparsky 1973, Halle & Marantz 1993). Exemplifying Vocabulary Insertion in Gayogo̲hó:nǫʔ is difficult due to the complexity of the language's morphology and due

to long distance dependencies between morphemes. In Table 4.1 below is included a toy-grammar Vocabulary Insertion for third-person pronominal prefixes and the neutral noun prefix on the noun *-nǫhs-* 'house'. In this Vocabulary Insertion, there are four possible pronominal prefixes, three of which are gendered third-person possessives (patient-series) and one of which is a neutral noun prefix which is used when the noun is unpossessed and unincorporated. The Vocabulary Insertion proceeds from the most positively specified feature bundle to the least. First are the two human possessors; they are positively specified for masculine and feminine. Given that the last of the three genders is non-human (neuter) and is used for all non-human possessors, one can model it using only the feature [POSS]. That leaves the non-possessive, noun prefix ga- as the Elsewhere Condition.

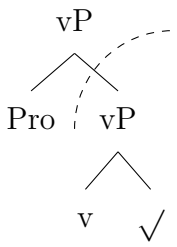
3^{rd} Pronominal Prefixes and <nǫhs>		
M,POSS	↔	honǫhsaʔ
F,POSS	↔	gonǫhsaʔ
POSS	↔	onǫhsaʔ
Elsewhere	↔	ganǫhsaʔ

Table 4.1: A Constrained Vocabulary Insertion

While they are many other theoretical notions and mechanical tools available in DM, the last concern to be discussed here is allomorphy. I assume, following Marantz (2001), that the nature of the Spell-out of terminal nodes in DM requires that allomorphy be conditioned highly locally. In particular, because Spell-out operates on terminal nodes and operates on each terminal node separately, allomorphy must be conditioned by elements in the same Spell-out domain. In assuming that category-defining heads may be phase heads, as discussed in Section 4.2, Spell-out domains may be as small as a root alone, if it is categorised without moving. In this case, a specifier on a categorising phrase will not be able to condition allomorphy on the root. In the hypothetical example below, the root cannot be conditioned by the pronoun in the

specifier because it is already shipped to the interfaces before the specifier is merged, as indicated by the dotted line. Since the root is already Spelled-out, it cannot be effected by anything above it, even heads within the same phrase.

(48)



Adopting Minimalism, Phase Theory, and DM will require that the analysis be constrained in several ways, most critically by: no Lexical reference in the syntax, Move as a Last Resort, and the Phase Impenetrability Condition. Before continuing on to the analysis proper, it is first necessary to situate this thesis within the Phonology by Phase Approach.

4.4 The Phonology by Phase Approach

Beginning with Marvin (2002) and subsequently applied to polysynthetic languages of Turtle Island by Barragan and Newell (2003) on Kupangaxwicham Pe'me̲melki (Cupeño: Uto-Aztecan), Newell (2008, 2015) and Newell and Piggott (2014) on Anishinaabemowin (Ojibwe: Algonquin) and by Weber (2020) on Siksiká (Blackfoot: Algonquin), the Phonology by Phase Approach proposes that the phases of the syntax control the feeding of the phonological system such that phonological domains can be derived solely through phase boundaries. To illustrate, consider Newell and Piggott's (2014) analysis of Anishinaabemowin (the Odawa variety in particular) hiatus resolution.

For the purposes of this illustration, there are two resolutions to hiatus in Anishinaabemowin: deletion, and tolerance. These are exemplified, respectively, by the data in (49) below, note that primary stress is indicated in (49c) by an acute accent and secondary stress by a grave.

(49) a. *Name:g*
name:-a:g
$\sqrt{sturgeon}$-PL

"Sturgeons" [Newell & Piggott 2014: 332]

b. *Inia:gamose:*
ini-a:gam-ose:
away-$\sqrt{snowshoe}$-$\sqrt{walk}$

"He walks away in snowshoes." [Newell & Piggott 2014: 333]

c. *Iníagwà:bizò*
ini-agwa:-bizo
away-$\sqrt{to.shore}$-$\sqrt{drive}$

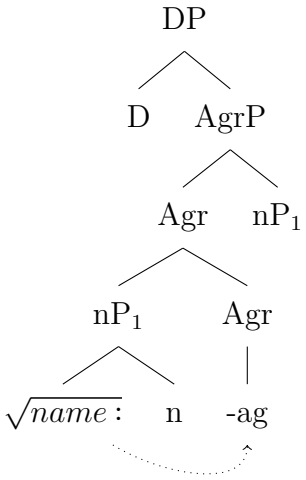
"He sails away to shore." [Newell & Piggott 2014: 339]

In (49a), the noun root /name:/ has been suffixed with a plural morpheme /a:g/ and deletion of the plural morpheme's vowel follows. In (49b) however, hiatus created between the preverb /ini/ and the incorporated noun /a:gam/ is not resolved. The data in (49c) is presented to show that the preverb is in a phonological word with the rest of the verb, as evidenced by the fact that the preverb can take the primary stress of the verbal complex. The question Newell and Piggott (2014) pose is why within one phonological word there should be a hiatus repair strategy and tolerated hiatus. They answer this question by appealing to the Spell-out domains of each structure.

In (49a), Newell and Piggott (2014) argue there is but one Spell-out domain; that of the DP. The root is first categorised by an nP but it cannot be shipped to Spell-out

because nouns in Anishinaabemowin provide necessary featural information which causes allomorphy on functional morphology higher up. Newell and Piggott (2014) argue - following the work of Bobaljik and Wurmbrand (2013) and Svenonious (2004) - that this requires that the phonological domain is extended until the features present on the root are valued by the higher functional morphology; here a plural agreement head. Once these features are valued, the material can be shipped. However, because the nP phase was withheld, all the material is shipped together at the DP phase, as in the simplified tree in (50).

(50)



In (49b), however, there is a vP phase boundary between the preverb and the incorporated noun, as in the simplified bracketing diagram in (51). Note that there is no extension to the vP phase in this example because there is no featural agreement between any terminal node in the vP phase and any higher element.

(51) [[away-a $_{aP}$][$\sqrt{snowshoe}$-$\sqrt{walk}$-v $_{vP}$] $_{EP}$]

Newell and Piggott (2014) argue that this boundary allows for hiatus as the constraint causing hiatus is a well-formedness requirement on syllables. Since syllabification in Anishinaabemowin is argued to occur at every phase and phases tend to preserve prosodic structure (Benua 1997), the syllable structure cannot be altered or deleted, and so hiatus results.

This study and others like it provide a framework within which the data presented in Chapter 2 can be interpreted. The analysis presented in the following section should be taken with this tradition in mind.

Chapter 5

An Analysis

This chapter will present an analysis of the phonological domains described in Section 2.3 as falling out from the output of a phase-based syntax. In particular, following Barrie (2018), it will be argued that the VoiceP and the CP phases correspond to the Joiner Epenthesis and /e/-Epenthesis phonological domains, respectively. However, contra Barrie (2018), the N+V Joiner Epenthesis operation will not be the head of a Topic Phrase, but rather will be argued to follow from a categorising little v phase.

5.1 The Noun-Verb Bundle and the Categorising v Head as a Phase

This section provides the foundation for the rest of the analysis. In brief, it will be proposed that the categorising little vP corresponds to the phonology found in the N+V bundle. The argumentation rests on the architecture of DM, the nature of the Phonology by Phase approach, and idiom data.

Recall that the Noun-Verb bundle is exceptional phonologically in that clusters

that are legal elsewhere in the verbal complex are broken up at the noun-verb boundary. For example, in (52a) the /kt/ cluster between the noun and verb is resolved through epenthesis. However the same phonological context does not lead to epenthesis when that boundary is between any other two morphemes, as in (52b).

(52) a. *Ohnegadáihę:*
o-hnek-a-táih-ę:
3.SG.N.PAT-$\sqrt{liquid}$-JOIN-$\sqrt{hot}$-STAT

"It is hot water." [Dyck et al. 2021]

b. *Ganǫhsotge:*
ka-nǫhs-ot-ke:
3.SG.N.AG-$\sqrt{house}$-$\sqrt{stand}$-AUG

"It is a big house." [Dyck et al. 2014: 35]

Data like this has lead researchers to propose that epenthesis at the noun-verb boundary is morphologically conditioned (Michelson 1988, Dyck 1990). In a model where the syntax is feeding the phonology in chunks and there may be different rules in each chunk of phonosyntactic computation, like the Phonology by Phase approach (see Section 4.4) or a Cophonology by Phase theory (Sande & Jenks 2018, Sande, Jenks & Inkelas 2020), we may expect that the N+V bundle should correspond to a phase. Along with phonological evidence, idiom formation also points towards an N+V bundle phase. This will be quickly described before an attempt will be made at characterising the N+V phase as a categorising little v phase.

Traditionally, idiom formation is assumed within the DM framework to be done internal to a phase (Marantz 1984; reiterated as inner and outer word formation in Arad 2003, 2005 and Marantz 2001, 2007). More recently, authors such as Marantz (2013) and Harley (2014) have argued that idiom formation can occur across phase

boundaries. However, for the purposes of this work, the common, traditional assumption of phase-internal idiom-formation will be assumed. There are many idioms in Gayogo̲hó:nǫʔ which are made of a noun root and verb root, to the exclusion of verbal suffixes; such as in (53) repeated from (34a).

(53) *Syadǫhsráę́díʔ*
s-hyatǫ-hsr-a-yę́tei-ʔ
2.SG.AG-$\sqrt{write}$-NLZR-JOIN-$\sqrt{know}$-HAB

"You are smart." [Froman et al. 2002: 300]

The idiomatic bundle in (53) is that of /hyadǫhsraędei/ which means 'to be smart' but is made of the roots for 'to write' and 'to know'; it could be translated equally idiomatically as 'to be book-smart.' Noun-verb bundle idioms can be used with multiple aspects and subjects with different phi-features without harming the meaning of the idiom. Evidence for the independence of idiomatic noun-verb bundles can be found in the paradigm in (54), below. The N+V idiom here is /-rihw-a-genh-/ literally 'word-argue', which is used to mean roughly 'to debate'. In (54a), the N+V bundle occurs with a stative suffix and a neuter prefix, here it is a existential nominal predicate. In (54b) and (54c), however, the pronominal prefix is human and the meaning is something like 'they debate'; hence they are lawyers or arbitrators. Notice that the switch to human subjects retains the underlying idiomatic meaning of debating even though (54b) and (54c) have both different phi-features and different aspectual suffixes. Finally, in (54d), there is a citation form that shows that when the incorporated noun is changed, the meaning no longer refers to debating. Therefore the 'to debate' meaning cannot be held in the verb root alone and the n+v bundle must be an idiom.

(54) a. *Degaihwágenhęh*
de-ga-rihw-a-genh-ęh
DU-3.SG.N.AG-$\sqrt{matter}$-JOIN-$\sqrt{argue}$-STAT

"There is an argument." [Dyck et al. 2021]

b. *Dęhadihwágenha*ʔ
dę-hadi-rihw-a-genh-aʔ
DU.FUT-3.PL.M.AG-$\sqrt{matter}$-JOIN-$\sqrt{argue}$-STAT

"They will be arbitrators." [Dyck et al. 2021]

c. *Dęhaihwágenhahs*
dę-ha-rihw-a-genh-a-hs
DU-3.SG.M.AG-$\sqrt{matter}$-JOIN-$\sqrt{argue}$-JOIN-HAB

"He is a lawyer." [Dyck et al. 2021]

d. *Saǫhwęjasgęnhęh*
sa-ǫhwęj-a-sgęnh-ęh
2.SG.AG-$\sqrt{earth}$-JOIN-$\sqrt{argue}$-STAT

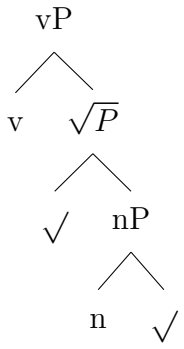
"You are fighting over the land right now." [Froman et al. 2002: 566]

That this bundle is behaving as a group to the exclusion of the rest of the verbal complex necessitates that the idiomatic bundle must be Spelt-out before the rest of the verb stem so that the meaning will not be affected when more grammatical elements are merged.

Having briefly given evidence for the need for an N+V phase within the verbal complex, this section will now turn to showing that this phase is the categorising v head, and providing a model for how it is formed.

A phase low in the verbal complex can be achieved by having the verb-forming v head merged as sister to the $\sqrt{}$P as in the generalised structure in (55), below. Note that this structure does not yet derive the proper word order of N+V.

(55)



In (55), a root has been merged with a little n to form an nP. This phrase is merged with another root to form a √P. The √P is then merged with a category-forming v to create a vP, the complement of which is then shipped to the interfaces; creating the N+V joiner domain. Over top of this structure would be merged the ApplP, AspP, and finally a VoiceP with transitive little v, which would send its complement to the interfaces; thus creating the verb stem domain. Note that this structure does not yet derive the correct surface morpheme order.

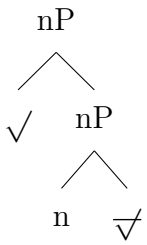
As an interim summary of the issues raised: we know from independent evidence presented in Section (3.3), and particularly the examples included in (46), that N+V joiner epenthesis cannot be the head of a low TopP. We also know from phonological patterns and idiom formation that the n+v bundle must be a phase, and that this phase is most simply analysed as a categorising v. This will require the use of a Split VP along the lines of Kratzer (1996). Before moving on, early in this section it was noted that there is diversity among the phase-identity of structures researchers have proposed for idiom formation, and that Marantz (1997) argues that the idiom formation domain of the categorising vP is the same as the external argument introducing VoiceP. However, the example set in (54) has shown that the vP idiom formation domain is not coextensive with VoiceP in Gayogo̲hó:nǫʔ. Regardless of whether idiom formation must be internal to a phase, it is clear from the phonological patterning

and cross-linguistic precedent that a categorising *v*P phase is well-motivated. With that in mind, future fieldwork and theoretical studies should interrogate the system of idiom formation in Northern Iroquoian with an eye for distinguishing domain layers. In the next section, a model of the *v*P will be provided through a phrasal movement analysis.

5.2 Building the *v*P

This section will present a model of the *v*P in Gayogo̲hó:nǫʔ assuming a uniformly phrasal-movement approach (Barrie & Mathieu 2012, 2016. In doing so, several movements will have to be stipulated to attain the correct morpheme order, including: evacuation of the noun root to Spec, *n*P, and raising of the entire *n*P to Spec, √P. To begin, recall the preliminary merge and move from Barrie and Mathieu (Barrie & Mathieu 2016), as in (56).

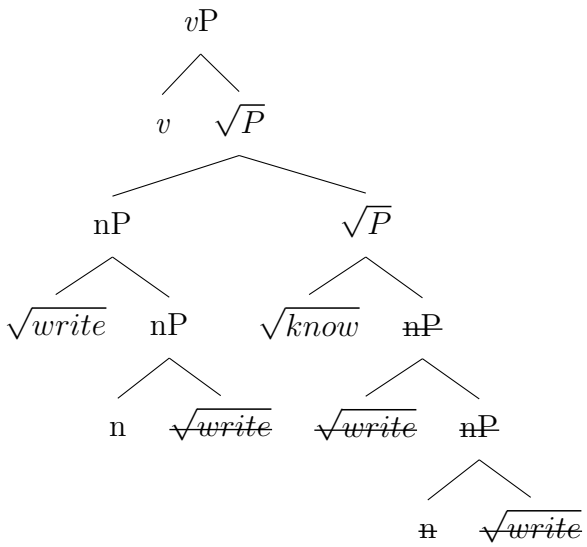
(56)



In (56), the nP is created by moving the root to Spec, nP. Note that this movement must be stipulated to be a requirement of the *n* because roots in DM cannot have the uninterpretable features that would motivate such a movement. This will be returned to later. Above this structure another root is merged. Based on the surface morpheme order, the *n*P must then raise above the verb root. Following the phrasal movement

method, this phrase must then move to Spec, √P. The structure of the noun-verb bundle being proposed here is presented in (57) for the verb stem /hyatǫhsrayętei/ 'to know paper/to be smart' from (34a).

(57)



Assuming that epenthesis is a phonological process that operates within a phase domain and that the phase has certain phonological rules or constraint rankings (Sande & Jenks 2018, Sande, Jenks & Inkelas 2020), this analysis allows for boundaries between all elements within the *v*P phase to be visible for epenthesis and for that phase to create 'spurious' epenthesis in a principled manner. In this way, epenthesis between the incorporated noun and verb root should no longer be considered 'spurious' as it merely has a different phonology, rather than being exceptional. The phonological model of this difference will be left for future work. However, they are a pair of concerns which need to be considered before addressing the rest of the analysis.

First, notice that there is an asymmetry between how the noun root is treated by its categorising head and how the verb root is treated. The noun root moves to the

Spec, *n*P while the verb root must - for the sake of morpheme order and phonology - not make the parallel move to Spec, *v*. Since roots cannot have grammatically active, i.e. uninterepretable, features, and roots are categorised by c-command, it must be assumed that this movement is a requirement of the *n* head. There is no evidence that *n* heads and their roots appear in any other arrangement. It therefore must be assumed that this is a special requirement of the *n* head and that phases are escapable; as assumed from the beginning of Phase Theory (Chomsky 2001). This unfortunately also leads to a lack of conclusive data on whether of not the *n*P is a phase. Nothing appears to the right of the nominaliser that could have originated in its complement, and so there is no evidence that it is or is not phasal. There is evidence that other category defining heads do not have the property requiring movement out of the phase. Assuming that the *v* has the phonological system which creates spurious joiner epenthesis, then one can be sure that the verb root does not escape the *v*P, and the same will be said for material in VoiceP and CP in Section 5.3. For clarity, I assume that the verb root does not need to raise above the categorising head as it is categorised by c-command (Harley & Noyer 1999). However, do note that the verbalising head is never overt and so this assumption cannot be proven by relative position of the root and a verbalising head.

Second, the raising of *n*P to Spec, √P does not have an obvious featural explanation. It is strictly necessary considering the morpheme order and phonological reality of the output, but moving to the specifier of a Spec, √P cannot have featural effects. It cannot be assumed that the move occurs after the merging of the categorising *v* either as this movement would violate restrictions which necessitate cyclicity (the Extension Condition: Chomsky 2001). Therefore one is again forced to argue that this movement is an idiosyncrasy of the *n*. This idiosyncrasy is echoed in other areas of the grammar. In fact, all elements which modify an *n* appear as suffixes: verbs, locative

suffixes, modifiers like the decessive or the diminutive, the noun forming suffix etc. Since there is no obvious featural motivation, this thesis assumes that incorporation will follow whenever an *n*P is merged in Comp, √P, but that this would be blocked by that *n*P being first incorporated into a DP structure. Given that this work is not focusing on motivating incorporation, this issue will be left for future research.

For completeness, note that it can be assumed that the phonological presence or absence of the nominaliser can be a matter of Vocabulary Insertion. Since the root and the *n* head are sisters, the root can cause allomorphy on the categorising head (Marantz 2001). It is assumed that one of the allomorphs of the nominalising head is null and that all roots must be categorised by the *n* to become a noun.

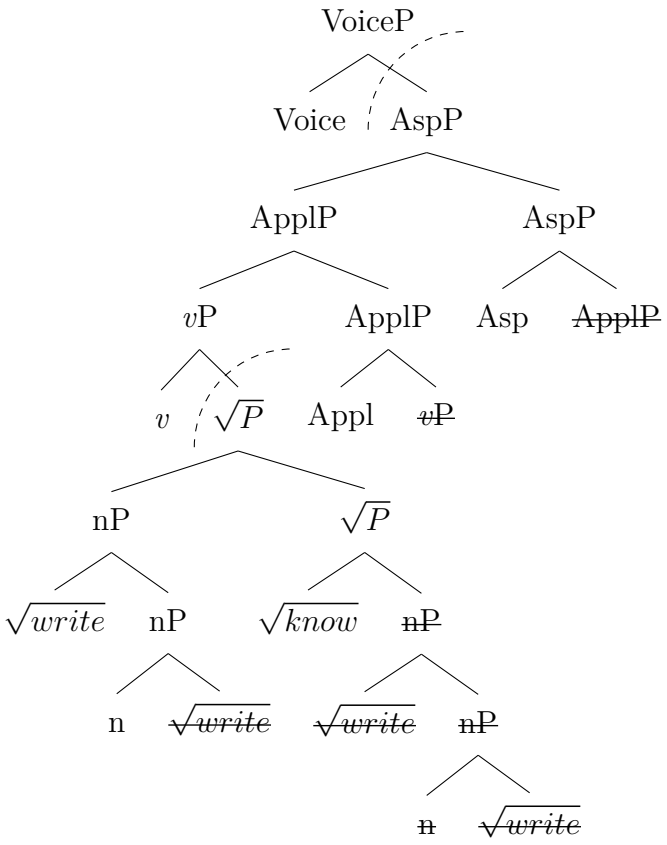
This section has argued for a categorising *v* phase which includes a *n*P and a bare verb root. The evidence for this phase comes from independent arguments for a categorising *v* head low in the structure and the norms of DM. It was assumed that this phase was associated with the spurious joiner epenthesis operation; leaving this phenomenon no longer spurious but instead arising from the phase having different phonology. There were two abnormal moves which centred on the *n* head. On the basis of phonological and morpheme-order evidence it was shown that the √ moves to Spec, *n*P, and that after this first move, the *n*P must move to Spec, √P. Neither of these movements have an obvious featural motivation, but with the morphosyntactic model assumed here, these movements are strictly necessary to obtain the correct data. Note that if one assumes that dummy noun incorporation and verb root suppletion, as in the example sets in (44) and (45) respectively, are driven by allomorphy conditioned by incorporation, then the model proposed here provides the an account of how the *n*P can become adjacent to the verb root prior to it Spelling-out. The rest of the analysis falls out from the model presented here.

5.3 The Rest of the Tree

Following the arguments and assumptions presented in the preceding section, this section will complete the tree of the verbal complex such that all the phonological domains can hold within their respective phases. This section will deal entirely with the VoiceP and CP phases.

Above the *v*P node is merged the Appl head forming the ApplP, according to the models of both Baker (1996) and Barrie (2018). The Appl head raises its complement to Spec, ApplP to check for some feature. It is unclear what this feature might be, though it is uncontroversial that the verb must raise to or above the Appl head (following the Mirror Principle as assumed in most Generative literature on Northern Iroquoian such as; Baker 1985, 1996, Barrie 2011). After this movement, the Asp head is merged to ApplP forming AspP and the *v*P is again raised to Spec, AspP. Again, the feature on AspP which requires that the *v*P move is unclear. Both AspP and ApplP require that they are suffixed to a verb, and only a verb, and so it may be that they require some abstract features [*v*, Asp] to be checked in a Spec, Head configuration with the *v*. This would be unsurprising as Appl heads require verbal material cross-linguistically (Pylkkänen 2008 and citations therein) and verbs condition whether they can appear with all three aspects or with only the stative (Dyck et al. 2021). Above this is attached the Voice head, and its complement is shipped to the interfaces. The tree then would be as in (58) below. Note that the dotted lines represent phase boundaries.

(58)



This tree allows for the VoiceP phase to correspond to the Verb Stem Joiner phonology and for the *v*P phase to correspond to the N+V Joiner phonology; providing a principled account for two phonological domains within the verb stem unlike Dyck (1990). Since the N+V Joiner epenthesis phase is contained within the Verb Stem Joiner epenthesis phase and they are co-terminus at the left edge, there are only two sites for extrametrical consonants; one at the boundary between Voice and its complement, and one at the left edge of the verbal complex as a whole. The model argued for here also allows for N+V Joiner epenthesis to be a phonological phenomenon - as opposed to a grammatical head - and for the *v*P phase to create idioms to the exclusion of the rest of the verb stem; without requiring the move to TopP which breaks the PIC and does not predict the breadth of noun incorporation

semantics besides. This model is therefore both theoretically and empirically better than the model presented in Barrie (2018). Note that future work on the semantics and morphosyntax of the diversity of noun incorporation in Northern Iroquoian may necessitate the use of a TopP for backgrounded incorporates, however, since backgrounded and non-backgrounded incorporates pattern the same with regards to epenthesis, a TopP has not been included in this analysis.

Above the VoiceP phase, this thesis follows Barrie's (2018) analysis of the CP phase in assuming that the morphemes above the Voice head do not engage in any movement operations and instead merely concatenate to the verb stem at PF. Motivating the ordering of prepronominal prefixes is beyond the scope of this thesis and has only recently been treated in Onyota'a:ká by Diaz, Koenig, and Michelson (2019). This thesis merely presents the order as predicted by the Mirror Principle (Baker 1985). Also note, that no /e/-Epenthesis is predicted to occur except between the pronominal slot and the nearest root because the phonological conditioning will never be met by the prepronominal prefixes (see Dyck et al. 2014 for a listing of the prepronominal forms).

In illustration, consider the example in (59), below, repeated from (5). This example includes an incorporated noun, verb stem joiner epenthesis and /e/-epenthesis, overt voice head, as well as a pair of prepronominal prefixes.

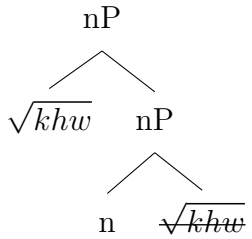
(59) *Ętgaǫdekǫnyáhne*ʔ
ę-t-kaǫ-at-e-khw-ǫny-a-hneʔ
FUT-CIS-3.F.PL.AG-SRF-EPEN-$\sqrt{food}$-$\sqrt{make}$-JOIN-PURP

"They will come and eat." [Dyck 1990: 18]

To begin, the noun root is merged with a categorising head and is moved to Spec,

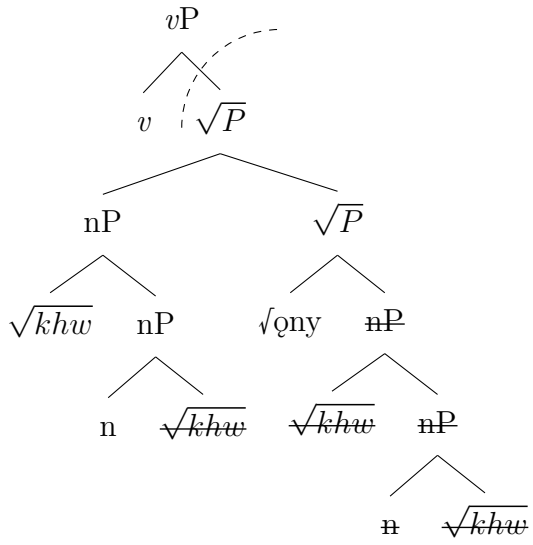
nP to satisfy some need of the n head, as in (60) below.

(60)



Then, the next root is merged above this and the nP moves to check for some other feature. The categorising v is merged, the uncategorised root is categorised, and the phase is shipped, creating the N+V domain, as in (61) below.

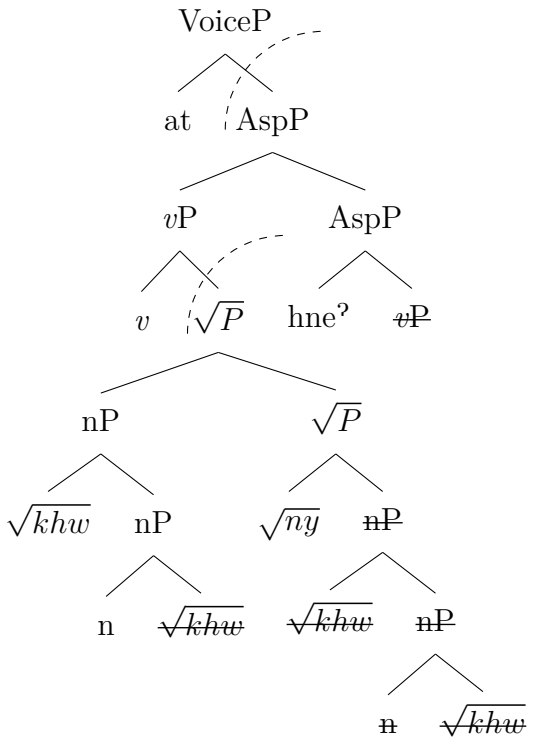
(61)



Next, the AspP is merged and the vP raises to Spec, AspP because the vP requires some feature checked by the Asp head. The Voice head is merged on top to make a VoiceP, and the phase is shipped, creating the verb stem joiner domain, as in (62) below. That the reflexives are phase heads provides a solution to the issue of reflexives being classed as part of the verb stem semantically but patterning with the

prefixes phonologically; as in the appearance of /e/-Epenthesis to their right. This solution then has greater data coverage than Dyck (1990) in accounting for the two domains within the verb stem, and the patterning of epenthesis to the right of the reflexives. Critically, this structure allows for Dyck's (2009) characterisation of the verb stem as a single phonological word to hold, despite the structure having two phonologically defined phases, because both the *v*P and VoiceP phases in the verb stem are coterminous at the left edge.

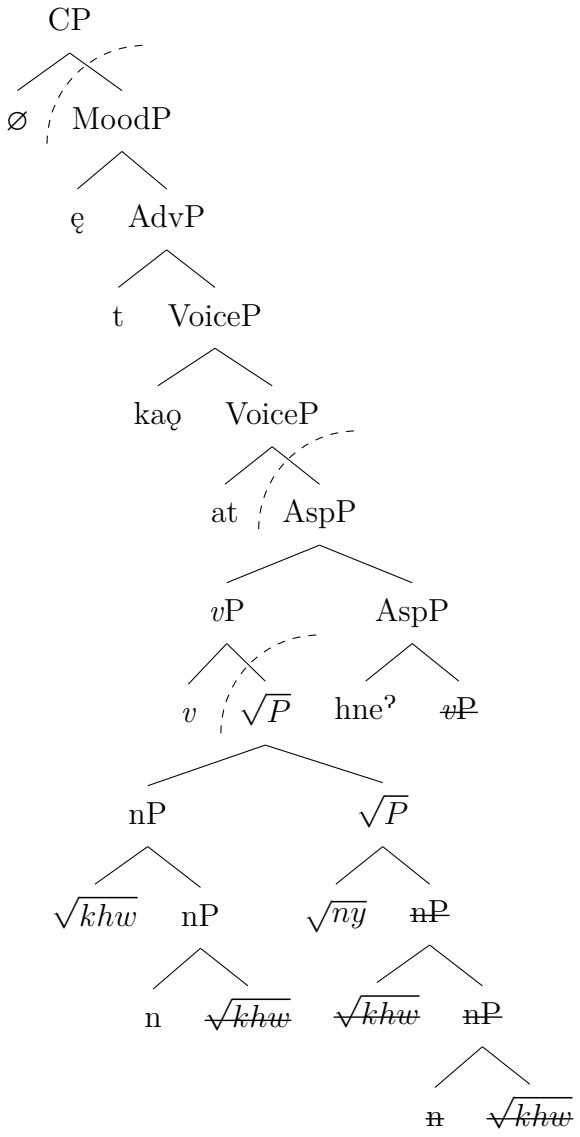
(62)



Above this structure is merged the pronoun in Spec, VoiceP. Above that is merged an AdvP for the cislocative, and higher still in MoodP is the future marker. For completeness, a null C is merged above and the whole structure is shipped as the final phase, containing the phonological rules or constraints driving /e/-Epenthesis, Accent Placement, etc. The prepronominal prefixes and the pronominal prefixes concatenate

to the verb stem at PF. This final tree is presented in (63).

(63)



This final structure is able to account for the domains of epenthesis and the extra-syllabic consonant domains using standard Phase Theory assumptions. To account for accent placement, which makes reference to the whole utterance to place primary stress, it must be that each higher phase is able to compute lower phases' material, an assumption also required in other Phonology by Phase works (see Newell & Piggott

2014 for example).

This chapter has argued for a categorising *v* phase low in the structure on the basis of idiom formation, phonological patterning, and cross-linguistic precedent. This low phase includes the incorporated noun and the verb root, and corresponds to the N+V Joiner domain. The use of a *v*P contrasts sharply with Barrie's (2018) model of N+V joiner epenthesis as the head of TopP. As was shown in Section 3.3, the TopP model cannot account for non-backgrounding varieties of incorporation (categorisation in particular), incorrectly predicts that non-backgrounded incorporates will have Verb Stem joiner epenthesis rather than N+V joiner epenthesis, and violates the PIC. The *v*P phase analysis presented here can account for multiple varieties of incorporation while requiring fewer movements, and is therefore simpler and has more empirical coverage. The *v*P is cyclically raised up the tree until Spec, AspP where the Voice head is merged. After the VoiceP is projected, its complement is shipped to the interfaces and corresponds to the Verb Stem Joiner epenthesis domain. Since both of these phases are co-terminous at the left edge, they may correspond to a single prosodic word under Dyck's (2009) account of prosody-syntax matching in Gayogo̲hó:nǫʔ. That the head of VoiceP is the reflexives provides a principled reason for the reflexives to pattern outside of the Verb Stem joiner domain, which was a shortcoming of the model presented in Dyck (1990), though the analysis presented here does not fare better than Dyck (1990) in predicting why the epenthesised vowel is different in the /e/-Epenthesis domain. Above this the prepronominal prefixes are concatenated to the verb stem (following Barrie 2018) to form the prosodic phrase level and to host another extrasyllabic consonant. The CP phase then corresponds to the remaining phonological processes: /e/-Epenthesis and Accent Placement phenomena. Note that a full phonological analysis is outside the scope of this study, but would be critically important in future research.

Chapter 6

Concluding

This study has provided a novel analysis of the long-standing problem of multiple phonological domains in Gayogo̲hó:nǫʔ. The analysis began from Barrie (2011, 2018) and Barrie and Mathieu's (2012, 2016) phrase movement method of structure building for the verb stem and assumed Distributed Morphology, the core tenets of Minimalism, and Phase Theory. Evidence was given for three phases within the syntax - the categorising *v*P phase, a VoiceP phase, and a CP phase - which were argued to be linked to different phonological rule sets or constraint sets, according to a Phase-by-Phase approach. This analysis allows for the Gayogo̲hó:nǫʔ verbal complex to have layered phonological domains while maintaining legibility for long-distance Agree relationships.

The analysis here has a number of benefits compared to previous works. First, this thesis' model has the advantage of not requiring that the phonology be able to access morphology identity information, as does Michelson (1988). Second, unlike Dyck (1990), it was able to account for two domains of epenthesis within the verb stem and for the reflexives to pattern with the prefixes rather than with the verb stem. Last,

the analysis here provides empirical and theoretical improvements to Barrie (2018) in that it can take all varieties of incorporation and respects well-established constraints on economy such as the PIC.

However, there are some outstanding issues relating directly to this analysis that should be addressed in future research. First, the move of the root to Spec, *n*P remains unexplained. It could be that the move is required by the *n* head for some kind of valuation, though the root and its categorising head are already sisters, and therefore local, and so it is unlikely that the *n* head requires a different configuration. Under standard assumptions in DM, there are no uninterpretable features on roots and so the root escaping a possible *n*P phase to get its features valued is also not a simple solution. This problem, therefore, remains open. Similarly, the move of the *n*P to Spec, √P is equally unmotivated. It is clear from the data that the *n*P must always move into a larger categorising structure, be it *v*P or DP, but there is no categorising structure yet available when the *n*P moves. Regardless of these concerns, it is clear from the data that the analysis presented here is strictly necessary, and so these questions are left to future research.

In focusing solely on the verbal complex, a number of other, broader research questions are left open for future work. This study does not address possible phases within the nominal domain. In particular, it does not discuss whether *n*P, *d*P, or nominal suffixes correspond to phases or phase heads. Similarly, Dyck's (2009) observation that particles can host extrasyllabic consonants was not addressed in the analysis here, though that pattern may have interesting implications for how particles are modelled in Generative studies of Northern Iroquoian morphosyntax. The phonological implementation of the final structures are also not addressed, and future research will have to propose new constraint rankings or rule orderings which take seriously

the domain layering argued for here. Additionally, though this thesis does consider them, no analysis of long-distance dependencies are proposed here. The multifarious ways that morphemes interact within the verbal complex is highly under-researched within the Northern Iroquoian family, and it is hoped that the syntactic structures proposed here will lay fruitful groundwork for this research.

Throughout this work other Northern Iroquoian languages are presented as comparable to Gayogo̲hó:nǫʔ, and there are comparable epenthesis phenomena in every language of the branch. This is not the case for Tsalagi and so it is hoped that the structure presented here will be useful in comparative syntactic studies between Northern and Southern Iroquoian. Additionally, it is hoped that the syntactic analysis presented here will be helpful in comparing Gayogo̲hó:nǫʔ with languages with a similar verbal complex, i.e. those with productive noun incorporation and a Voice head splitting the complex. Last, this study presents more clear evidence in the ongoing debate on the fractured nature of the polysynthetic word (Bickel & Zúñiga 2017, Zúñiga 2019), and its origin as an artifact of the phonology (Branigan, Brittain & Dyck 2005).

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Appendix A

Consonant Clusters by Position

This appendix includes the attested consonant clusters by position as presented in Dyck (1999). It is written in the Linguistic Orthography. Note that in Table A.1 the brackets indicate a rare form and that in Table A.3 the brackets indicate which consonant is deleted following word final consonant deletion (see Dyck 1999).

$C_2 \rightarrow$ $C_1 \downarrow$	y	w	r	n	t	k	s	h	ʔ
w, y, r									
n								(nh)	
t	ty	tw	tr	tn		tk	ts, tsh, tsy	th	
k	ky	kw	kr	kn	kt			kh	
s	sy	sw	sr	sn	st	sk, skr		sh	
h									
ʔ									

Table A.1: Word Initial Clusters

$C_2 \rightarrow$ $C_1 \downarrow$	y	w	r	n	t	k	s	h	ʔ
w, y, r									
n	ny		nr						
t	ty		tr			tk, tkw, tkhw tkt, tkn, tsn	ts, tsy, tsh	th, thw, thy thr, thn	tʔ
k	ky		kr		kth		ksh	kh, khn	kʔ
s	sy	sw	sr	sn		skw	sh		sʔ
h				hn, hnh hny	ht, htk hth, hthw	hk, hkw, hkr hkhw	hs, hsh, hsr hsth, hsʔ		
ʔ					ʔt, ʔth ʔthr	ʔk, ʔkh, ʔksk	ʔs, ʔsh	ʔh	

Table A.2: Word Medial Consonant Clusters

$C_2 \rightarrow$ $C_1 \downarrow$	y	w	r	n	t	k	s	h	ʔ
w, y, r, n									
t		t(w)				k(t)	(t)s		
k		k(w)					(k)s		
s					s(t)	s(k)			
h					h(t)	hk hk(w)	hs, hs(t)		
ʔ					ʔt	ʔk, ʔk(t)	ʔs		

Table A.3: Word Final Consonant Clusters